NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 17

Common Name: **Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina and Murray Darling Depression Bioregions)**

Scientific Name: *Muehlenbeckia florulenta - Chenopodium nitrariaceum - Acacia salicina - Acacia stenophylla / Sclerolaena tricuspis / Senecio cunninghamii var. cunninghamii - Einadia nutans subsp. nutans*

Veg. Comm. ID.: **17** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID17a_img040pc.jpg Muehlenbeckia florulenta - Chenopodium nitrariaceum shrubland, near Wakool, [AGD66 35°36'34.3"S 144°29'22.3"E], 11/4/02, Jaime Plaza.

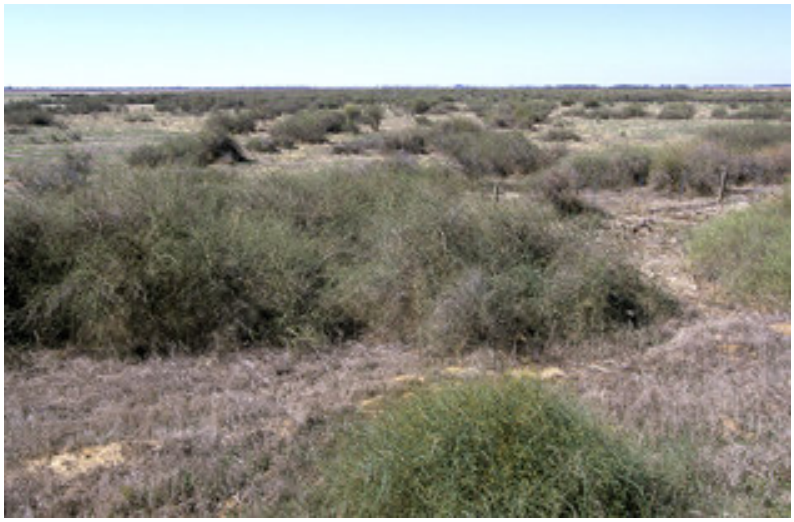


Photo 2: ID17b_img039pc.jpg Muehlenbeckia florulenta - Chenopodium nitrariaceum shrubland, near Wakool, [AGD66 35°36'34.3"S 144°29'22.3"E], 11/4/02, Jaime Plaza.

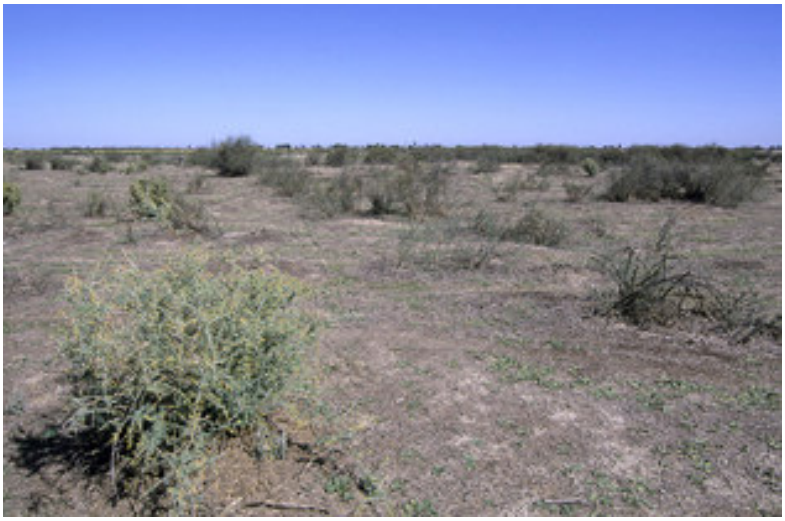
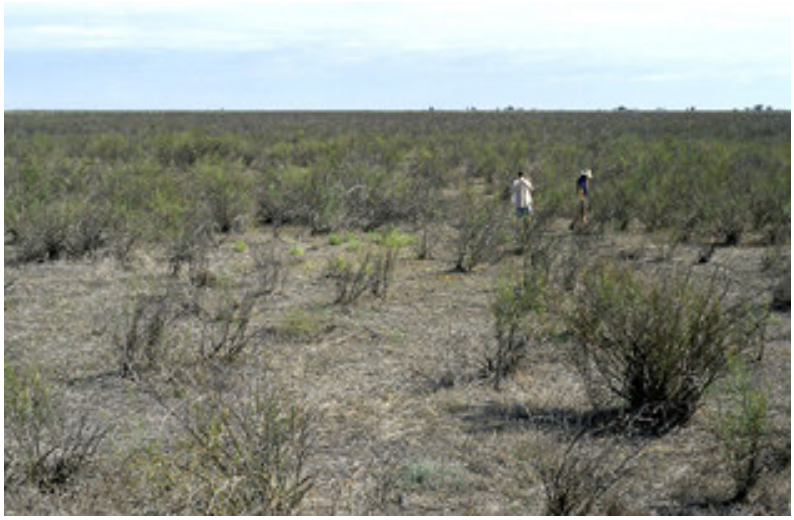


Photo 3: ID17c_img052pc.jpg Muehlenbeckia florulenta shrubland, south of Maude, [AGD66 34°32'37.1"S 144°18'33.9"E], 12/4/02, Jaime Plaza.



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

Trees: *Eucalyptus largiflorens.*

Shrubs/Vines/Epiphytes: *Muehlenbeckia florulenta; Chenopodium nitrariaceum; Acacia salicina; Acacia stenophylla; Nitraria billardierei; Eragrostis australasica; Atriplex vesicaria subsp. vesicaria; Sclerolaena muricata var. muricata.*

Ground Cover: *Sclerolaena tricuspis; Atriplex lindleyi; Sclerolaena stelligera; Marsilea drummondii; Atriplex suberecta; Juncus flavidus; Rumex tenax; Salsola tragus subsp. tragus; Einadia nutans subsp. nutans; Senecio cunninghamii; Senecio glossanthus; Calotis scabiosifolia var. scabiosifolia; Brachyscome ciliaris var. ciliaris; Bulbine bulbosa; Walwhalleya proluta; Geranium sp. (retrorsum); Oxalis chnoodes; Typha domingensis; Austrostipa aristiglumis; Panicum laevinode; Enteropogon ramosus; Enteropogon acicularis.*

Weed Species: *Lolium perenne; Phyla canescens; Euphorbia planiticola; Modiola caroliniana; Hordeum leporinum; Rapistrum rugosum.*

Weediness: Medium (5-15%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: 14±2 (Horner et al. 2003 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Shrubland; Open Chenopod Shrubland.

Height Class (WH): Tall.

Vegetation Description: Open shrubland usually up to 2 m high dominated by Lignum (Muehlenbeckia florulenta) often with Nitre Goosefoot (Chenopodium nitrariaceum) and low cover of Canegrass (Eragrostis australasica). Scattered trees of Black Box (Eucalyptus largiflorens) may be present. Cooba (Acacia salicina) and River Cooba (Acacia stenophylla) may be present as tall shrubs. Ground cover species include the small shrubs such as Giant Redburr (Sclerolaena tricuspis), Roly Poly (Sclerolaena muricata var. muricata), Atriplex lindleyi, Atriplex suberecta and Salsola tragus subsp. tragus, the fern Marsilea drummondii, the rush Juncus flavidus, the forbs Rumex tenax, Einadia nutans subsp. nutans, Bulbine bulbosa, Senecio glossanthus and Senecio cunninghamii. Grass species include Walwhalleya proluata and Enteropogon ramosus. Weed species include Lolium perenne, Hordeum leporinum and Rapistrum rugosum. Occurs on black, brown and grey-cracking clay soils and clay loam soils in river channels and depressions on floodplains subject to regular flooding in south-western NSW extending into Victoria and South Australia mainly in the semi-arid (warm) climate zone. Although very widespread it tends to have a consistent floristic composition. Grades into Black Box or River Red Gum woodlands near major rivers and into Bladder Saltbush or other chenopod shrublands on higher ground. Large areas of Lignum have been cleared for cropping in the middle-western and eastern parts of its range including in the Lowbidgee region on the Murrumbidgee River floodplain. Some stands remain in the west. This community is becoming increasingly threatened by clearing and altered flooding regimes due to irrigation developments. Reduced flooding is leading to the dieback of Lignum in some areas. Tree dieback from drought has increased since 2000.

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

Formation Group: Freshwater Wetlands: Inland Aquatic, Swamp and Shrubland Communities.

State Veg Map (Keith 2004): Inland Floodplain Shrublands.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Other shrublands.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Combination of Expert Opinion and Quantitative Data). Lignum of south-western NSW mainly in the semi-arid (warm climate zone). Mapped as part of community 18 in Scott (1992), Porteners (1993) and Porteners et al. (1997). Discussed but not mapped by Fox (1990) for the Mildura region. Map unit R4 on the Lachlan River in the in the Cargelligo region in Sivertsen & Metcalfe (1995). Listed as community 29 in Smith & Smith (1990) and included in Pressey (1984) for the Great Cumbung Swamp. Community 4g in Westbooke & Miller (1995) covering Mungo National Park. Includes floristic group 13 being part of map units 6,7 & 8 in Horner et al. (2002) covering the Hay Plain area. Includes BVT 62 in DEC (2006a).

Interstate Equivalent(s): Victoria: EVC 823 Lignum Swampy woodland; South Australia: includes the Lignum in the eastern pastoral regions of South Australia documented in Davies (1982).

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

Mapping Info: Mapped as Lignum community in RBG mapping for S/W NSW. R4 in Sivertsen & Metcalfe (1995). Eardley (1999) combines the RBG maps to reveal 363500 ha of Lignum extant in Riverina Bioregion but this includes mosaics of other communities such as Nitre Goosefoot (ID160). This lignum community also occurs outside that Bioregion. Horner et al. (2002) map Lignum in the Hay Plain but as map unit 6 and part of mosaic map units 7 & 8.

Climate Zone: Semi-arid: warm (winter rain); Arid: hot (persistently dry).

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

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

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

Local Govt. Areas: Balranald (1-30%); Berrigan (1-30%); Carrathool (1-30%); Conargo (1-30%); Deniliquin (1-30%); Hay (1-30%); Lachlan (1-30%); Leeton (1-30%); Murray (30-70%); Murrumbidgee (30-70%); Wakool (1-30%); Wentworth (1-30%); Urana (1-30%).

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

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Clay.

Great Soil Group: Grey clay; Grey earth.

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

Landform Patterns: Flood plain.

Landform Elements: Backplain; Drainage depression; Stream bed; Swamp.

Land Use: Cropping and Horticulture; Grazing.

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

Pre-European Extent: 400000 ha ±30%. Estimated from extant vegetation maps: full range.

Pre-European Extent Comments: Estimate only based on RBG mapping of south-western NSW with additional areas to the east.

Current Extent: 150000 ha ±30% or 38% ± 50% of pre-European extent remaining.

Current Extent Comments: (Estimated from mapped extant vegetation: full range). Based on Eardley (1999) for Riverine Plain that was

derived from RBG and other mapping of south-western NSW with additional areas estimated for areas outside this mapping including to the east on the Lachlan River (Sivertsen & Metcalfe (1995). Horner et al. (2002) map about 80000 ha of Lignum being all of map unit 6 and half of map units 7 and 8 on the Hay Plain. Eastern occurrences have largely been cleared as has most of the original Lowbidgee Lignum wetland on the Murrumbidgee River floodplain (Cross et al. 1991). This current extent figure is deceptive as many areas of Lignum are threatened by less abundant flooding due to weirs, dams and irrigation draw-off from rivers.

Conservation Reserves: Lachlan Valley NR 75 (E1); Kalyarr NP 700 (E2); Kemendok NR 11 (E1); Morrisons Lake NR 20 (E2); Mungo NP 100 (E3); Oolambeyan NP 493 (M); Wilbertroy FR 2 (E4); Willandra NP 1000 (E3); Yanga NP 670 (E3); Y-Murrumbidgee Valley NR 150 (E2); Yanga SCA 10 (E3).

Reserves Total Area: 3231 ha. ***No. Representatives in Reserves:*** 11

Protected Area Explanation: Lachlan Valley (prev. Goonawarra) Nature Reserve from Horner et al. (2002) and similar to NPWS (undated d). Wilbertroy Flora Reserve estimate from notes in Forestry Commission (1989a). Kemendok NR from Margules & Partners (1990). Mungo NP estimate from Westbrooke & Miller (1995). Oolambeyan NP area from Roberts & Roberts (2001). Morrisons Lake NR from Brickhill (1977) and Porteners (1993). Willandra NP less than half that mapped by Porteners (1993) because most is Nitre Goosefoot ID160 (J. Brickhill pers. comm.). Kalyarr NP estimate from summing all of map unit 6 with half of the composite map units 7 and 8 mapped over the reserve by Horner et al. (2002). Murrumbidgee Valley NR Yanga NP and SCA estimates from Scott (1992) map unit 18, NSW DEC (2005) and NSW NPWS (undated b). PA DE9905 from overlaying Porteners (1993). 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: DE9905 PA 110 (M).

Secure PAs Total Area: 110 ha. ***No. Representatives in Secure Property Agreements:*** 1

Protected Current Extent: 2.22% 3341 ha ± 30%. ***No. Representatives in Protected Areas:*** 12

Protected Pre-European Extent: 0.83% 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: Gunnaramy Swamp in Willandra Ana-Branch system Pooncarie 1:250 000 map sheet. Remnants in Lowbidgee area and the Great Cumbung Swamp region on the Murrumbidgee and lower Lachlan River floodplains with some areas protected in 2005 in Yanga NP.

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: Lignum forms dense stands in channels and depressions where inundation persists after floods or rain. Lignum generally requires flooding every 3-10 years (Beadle 1981) but prolonged periods of inundation will kill Lignum. Ground cover varies depending on flooding regimes and grazing pressure.

Fire Regime: Some landholders burn Lignum to promote herbaceous ground cover for stock grazing but frequent fire can kill it but it can survive occasional fire by resprouting. An appropriate inter-fire period may be in the order of several decades.

Adjoining Communites: Grades into various chenopod shrublands on the plains, into Black Box woodland (ID13 and 15) near channels. Grades into the north-eastern Lignum community ID247 in the northern NSW wheatbelt and into the Lignum community ID25 in the north western of NSW.

Threatening Processes: Considered to be Vulnerable due to threats from clearing for crops and altered flooding regimes. Extensively cleared for crops on the Lachlan River and in the Lowbidgee region on the lower Murrumbidgee River where about half of the original 40000 ha had been cleared by 1988 (Cross et al. 1991). Also, extensively cleared around Deniliquin. Poorly reserved and threatened by clearing and changed flooding regimes due to irrigation developments. Phyla canescens is a potential weed as it is in northern Lignum communities.

Threatening Process List: Clearing for agriculture; Dryland cropping; Irrigated cropping (incl. horticulture);Hydrology (drainage); Salinity; Unsustainable grazing and trampling by stock.

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

Planning Controls:

Planning and Management: Lignum requires intermittent flooding to survive, therefore, it is important flooding regimes to floodplains are enhanced as at present they are reduced. Further drainage and cropping of Lignum areas should be banned given the amount that has already been cleared.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (3; 10; 76; 314; 309; 16; 24; 12; 289; 155; 11; 28; 342; 306; 14; 247; 13; 9; 33; 373). Beadle, N.C.W. (1981) The vegetation of Australia. (Cambridge University Press: Cambridge); Benson, J.S. (1989) Establishing priorities for the conservation of rare or threatened plants and plant associations in New South Wales. In Hicks, M. & Eiser, P. (eds.) The conservation of threatened species and their habitats. (Aust. Comm. for IUCN: Canberra); Brickhill, J. (1977) Morrisons Lake Nature Reserve proposal. Investigation report. Unpublished. (NSW National Parks and Wildlife Service: Hurstville); Cross, H.C., Wettin, P.D. & Keenan, F.M. (1991) Corridors for wetland conservation and management? room for conjecture. pp. 159-165 in Saunders, D.A. & Mobbs, R.J. (eds.) Nature conservation 2: the role of corridors. (Surrey Beatty & Sons: Sydney); Davies, R.J.P. (1982) The conservation of major plant associations in South Australia. (Conservation Council of South Australia Incorporated: Adelaide); Eardley, K.A. (1999) A foundation for conservation in the Riverina Bioregion. Unpublished Report. (NSW National Parks and Wildlife Service); Forestry Commission of NSW (1989a) Forest preservation in state forests of New South Wales. Research Note No. 47. (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); 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); Mills, R. (1984) Mungo National Park Vegetation Map. In vegetation study of Mungo National Park. (NPWS Lower Darling District: Mildura); NSW Department of Environment and Conservation (2005) New Area Investigation Report: Yanga. Unpublished Report (DEC: Dubbo); NSW National Parks and Wildlife Service (undated b) Yanga Nature Reserve vegetation map from interim management guidelines. File records. (NSW National Parks and Wildlife Service: Lower Darling); 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; 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); Westbrooke, M.E. & Miller, J.D. (1995) The vegetation of Mungo National Park, western New South Wales. Cunninghamia 4(1): 63-80; 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 24

Common Name: **Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains**

Scientific Name: *Eragrostis australasica - Muehlenbeckia florulenta - Sclerostegia tenuis / Chloris truncata - Disphyma crassifolium subsp. clavellatum - Eragrostis setifolia - Marsilea drummondii*

Veg. Comm. ID.: **24** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID24a_dsc_2609.jpg Cane Grass (Eragrostis australasica) swamp, approx.100km WNW of Bourke, [AGD66 29°59'36"S 145°0'58"E], 26/8/03, Jaime Plaza.

Photo 2: ID24b_img274pc.jpg Cane grass (Eragrostis australasicus) shrubland. Pambra Tank Swamp, NE of Pooncarie, [AGD66 33°09.77'S 142°32.80'E], 7/5/94, J.S. Benson.

Photo 3: ID24c_img088pc.jpg Eragrostis australasica - Muehlenbeckia florulenta grassland, west of Yelta Lake, [AGD66 33°20'39.4'S 141°44'49.4'E], 14/4/02, Jaime Plaza.

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

Trees: *Eucalyptus largiflorens.*

Shrubs/Vines/Epiphytes: *Eragrostis australasica; Muehlenbeckia florulenta; Sclerostegia tenuis; Chenopodium nitrariaceum; Atriplex holocarpa; Sclerolaena muricata var. muricata; Eremophila bignoniiflora; Eremophila polyclada; Teucrium racemosum; Halosarcia pergranulata subsp. pergranulata.*

Ground Cover: *Chloris truncata; Disphyma crassifolium subsp. clavellatum; Marsilea costulifera; Marsilea drummondii; Diplachne fusca; Eragrostis setifolia; Lachnagrostis filiformis; Austrostipa aristiglumis; Amphibromus nervosus; Eragrostis eriopoda; Eragrostis parviflora; Eleocharis pallens; Eleocharis acuta; Cyperus gymnocaulos; Centipeda cunninghamii; Juncus aridicola; Juncus flavidus; Disphyma crassifolium subsp. clavellatum; Sclerolaena divaricata; Sclerolaena tricuspis; Sclerolaena intricata; Sclerolaena divaricata; Trianthema triquetra; Osteocarpum acropterum var. acropterum; Osteocarpum acropterum var. deminuta; Atriplex semibaccata; Atriplex spongiosa; Atriplex spinibractea; Atriplex lindleyi; Swainsona swainsonioides; Plantago drummondii; Daucus glochidiatus; Portulaca oleracea; Frankenia serpyllifolia; Minuria integerrima; Minuria cunninghamii; Pycnosorus globosus; Calotis hispidula; Brachyscome lineariloba; Gnephosis arachnoidea; Epaltes cunninghamii; Calotis latiuscula; Stemodia florulenta; Azolla filiculoides; Calocephalus sonderi; Ranunculus sessiliflorus var. sessiliflorus; Rumex tenax; Myriocephalus rhizocephalus; Brachyscome lineariloba; Tetragonia eremaea; Myriophyllum crispatum; Myriophyllum verrucosum; Pratia darlingensis; Senecio runcinifolius.*

Weed Species: *Xanthium occidentale; Hordeum marinum; Lolium rigidum; Lolium perenne; Spergularia rubra; Medicago polymorpha; Medicago praecox; Phalaris paradoxa; Polygonum aviculare.*

Weediness: Low (<5%) with 10-30% cover.

Threatened Plants: Aponogeton queenslandicus; Atriplex infrequens; Atriplex sturtii; Dentella minutissima; Dysphania platycarpa; Eleocharis obicis; Pimelea elongata; Solanum karsense.

Threatened Fauna: Grey Grasswren; Magpie Goose; Australian Bustard; Bush Stone-curlew; Pied Honeyeater; Little Pied Bat; Black-necked Stork; Grey Falcon; Brolga; Black-tailed Godwit; Square-tailed Kite; Blue-billed Duck; Redthroat; Long-haired Rat; Painted Snipe; Yellow-bellied Sheathtail-bat; Freckled Duck; Masked Owl.

Mean Species Richness: 10±3 (Hunter & Fallavollita 2003 in 20x20 m in plots during drought); 22±1.5 (Horner et al. (2002) in 20x0 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Grassland; Sparse Grassland.

Height Class (WH): Tall; Very Tall.

Vegetation Description: Tall, tussock grassland dominated by Canegrass (Eragrostis australasica) growing to over 2 m high ranging in cover from dense to isolated plants. Sometimes growing with Glasswort (Sclerostegia tenuis) or samphire Halosarcia pergranulata. Depending which part of NSW a range of grass species may be present including Windmill Grass (Chloris truncata), Blown Grass (Lachnagrostis filiformis), Plains grass (Austrostipa aristiglumis), Neverfail (Eragrostis setifolia) and Eragrostis parviflora. A range of low shrubs occur including Sclerolaena spp., Atriplex spp. and Teucrium racemosum. Sedges such as Eleocharis acuta, Eleocharis pusilla and Eleocharis pallens may be common along with rushes (Juncus spp.). The aquatic Marsilea drummondii, M. costulifera, Azolla filiculoides and Myriophyllum spp. May be present but die off in dry times. Highly salt tolerant plant species are more common in western-most areas and include Disphyma crassifolium subsp. clavellatum, Frankenia serpyllifolia and Osteocarpum acropterum. There is considerable floristic variation across its range and this sub-formation could be divided into a number of communities but several dominant species tend to be consistently present. Occurs on heavy non-cracking clay and silty clay soils in periodically flooded depressions on floodplains, alluvial plains, claypans in sand dune and sandplain areas, and floodouts of watercourses. Soils are red-grey compact clay or sandy clay that crack very little. These soils form claypans that pond from local runoff after rain. Widespread. Distributed in throughout western NSW in the arid and semi-arid zones. Not threatened overall but most areas have been subjected to grazing and trampling by stock and feral animals. Some eastern occurrences are more threatened due to surrounding clearing and changed flooding regimes on floodplains.

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

Formation Group: Grasslands of Freshwater Aquatic Habitats of Periodically Flooded Soils.

State Veg Map (Keith 2004): Inland Floodplain Shrublands.

State Landscape (Mitchell 2002): Mallee Cliffs Salt Lakes and Playas; Sturt Dunes;.

NVIS Major Veg Sub-Groups: Naturally bare sand, rock claypan.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Combination of Expert Opinion and Quantitative Data). Alliance 5.2.7 in Beadle (1981). Map unit 13 the RBG mapping of south western NSW (Fox 1991, Scott 1992 and Porteners 1993). Part of map unit 38 in Pickard & Norris (1994) covering NW NSW. Part of Lignum and Canegrass map unit in Westbrooke et al. (2003). "Canegrass Swamp" in Kingsford & Porter (1999). Community K in Morcom (1988). Community 5a in Westbrooke et al. (1998). Part of vegetation alliance 3 in Milthorpe (1991). Small areas mapped by Dykes (2002) in the Cobar Shire. Floristic group NW19 being part of grassland map unit GRL5 in Lewer et al. (2003). Future analyses may determine several associations.

Interstate Equivalent(s): Queensland: includes regional ecosystem 5.3.16 (Sattler & Williams 1999); South Australia: Floristic group 35 in Playfair & Robinson (1997) and Eastern Pastoral region Canegrass in Davies (1982 p. 81); Victoria: EVC 291 Canegrass Wetland.

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

Mapping Info: Easily mapped due to location in claypans but without ground checking can be confused with Lignum and Golden Goosefoot shrublands. Many stands of Canegrass are not shown on maps due to scale. Areas mapped in Pickard & Norris (1994) are combined Canegrass and Lignum. Other mapping includes NFPC (2004) in northern floodplains. In south-western NSW Scott (1992), Fox 3000, Porteners et al. (1997), Porteners (1993) and central NSW Dykes (2002) and Lewer et al. (2003).

Climate Zone: Semi-arid: warm (winter rain); Semi-arid: hot (persistently dry); Arid: hot (persistently dry).

IBRA Bioregion (v6): Broken Hill Complex (1-30%); Channel Country (1-30%); Darling Riverine Plains (1-30%); Mulga Lands (1-30%); Murray-Darling Depression (1-30%); Riverina (1-30%); Simpson-Strzelecki Dunefields (1-30%).

IBRA Sub-Region: Barnato Downs (1-30%); Barrier Range Outwash, Fans and Plains (1-30%); Bogan-Macquarie (1-30%); Bulloo Dunefields (1-30%); Bulloo Overflow (30-70%); Canbelego Downs (1-30%); Castlereagh-Barwon (1-30%); Central Depression (1-30%); Tibooburra Downs (1-30%); Culgoa-Bokhara (1-30%); Darling Depression (1-30%); Great Darling Anabranch (1-30%); Kerribree Basin (1-30%); Lachlan (1-30%); Menindee (1-30%); Narrandool (1-30%); Nebine Plains, Block Range (1-30%); Nymagee (1-30%); Paroo Sand Sheets, Cuttaburra-Paroo (30-70%); Paroo-Darling Sands (1-30%); Pooncarie-Darling (1-30%); South Olary Plain, Murray Basin Sands (1-30%); Strzelecki Desert, Western Dunefields (1-30%); West-Warrego - Tablelands and Downs (1-30%); White Cliffs Plateau (1-30%).

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

Local Govt. Areas: Balranald (1-30%); Bogan (1-30%); Bourke (1-30%); Brewarrina (1-30%); Broken Hill (1-30%); Carrathool (1-30%); Central Darling (1-30%); Cobar (1-30%); Hay (1-30%); Unincorporated (30-70%); Warren (1-30%); Wentworth (1-30%).

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

MD Basin: Yes.

Substrate Mass: Halite; Lacustrine sediment; Red-brown hardened materials.

Lithology: Clay; Red-brown hardpan.

Great Soil Group: Red and brown hardpan soil.

Soil Texture: Medium clay; Silty clay loam.

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

Landform Elements: Drainage depression; Playa; Swale.

Land Use: Grazing.

Impacts of European Settlement: Major alteration of species composition.

Pre-European Extent: 500000 ha ±50%. Estimated based on maps of current vegetation.

Pre-European Extent Comments: Based on Pickard & Norris (1994) for north/west NSW and RBG mapping for S/W NSW with additional areas added for eastern NSW.

Current Extent: 400000 ha ±50% or 80% ± 80% of pre-European extent remaining.

Current Extent Comments: (Estimated from a more broadly classified vegetation map). Pickard & Norris (1994) lump Canegrass with Lignum and it is assumed that about 200000 ha occurs in the north-western quarter of NSW. NFPC (2004) map about 25000 in northern floodplains. In south west NSW Scott (1992) maps 4000 ha, Fox (1991) 3000 ha, Porteners et al. (1997) 6000 ha and Porteners (1993) about 53,500 ha. Dykes (2002) maps 5000 ha in Cobar Shire. Part of the 9375 ha of a broad grassland type mapped in central NSW in Lewer et al. (2003). Varies from large areas to small pans - all of which add up to a large overall extent in NSW.

Conservation Reserves: Kalyarr NP 430 (E3); Mungo NP 100 (E3); Nocoleche NR 500 (E3); Paroo-Darling NP 1600 (E3); Pindera Downs AA 7000 (E3); Sturt NP 1000 (E3); Willandra NP 123 (E3); Yanga SCA 10 (E3); Paroo-Darling SCA 370 (E1); Toorale NP 8000 (E4).

Reserves Total Area: 19133 ha. ***No. Representatives in Reserves:*** 10

Protected Area Explanation: Some far NW NSW reserves from Pickard & Norris (1994). RBG mapping for reserves in south western NSW along with Westbrook & Miller (1995) for Mungo NP. Willandra NP from Porteners (1993). Paroo-Darling NP estimate from Westbrooke et al. (2003) 1000 ha for Peery Lake section and Hunter & Fallavollita 2003a) for Thilta Karra section. Paroo-Darling SCA from Mt Murchinson section in Westbrooke & Gowans (2006). Kalyarr NP area from parts of map units 6, 7 and 10 in Horner et al. (2002). Noted in Nocoleche NR by Bayliss (1977). Yanga SCA from Scott (1992). In PAs AL9907, AL9908 and CD9901 from DIPNR PA database notes but these are estimates only. Toorale NP estimate based on lands systems mapping and limited DECC descriptions, it needs updating with improved mapping.

Secure Property Agreements: AL9907 PA 5 (E1); AL9908 PA 5 (E1); CD9901 PA 2 (E1).

Secure PAs Total Area: 12 ha. ***No. Representatives in Secure Property Agreements:*** 3

Protected Current Extent: 4.78% 19145 ha ± 30%. ***No. Representatives in Protected Areas:*** 13

Protected Pre-European Extent: 3.82% 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: Poorly protected in the eastern part of its range e.g. Lake Cowal, other playas and lakes due to clearing and water extraction.

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

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

Variation & Disturbance: Requires periodic inundation during floods to stimulate germination of a range of plant species. Ground cover varies depending on time since and duration of inundation. Canegrass dies off during drought leaving persistent culms.

Fire Regime: Little ground cover is present to carry a fire - dense stands may occasionally burn. Hunter & Fallovillita (2003) suggest fire should not occur more than twice per decade.

Adjoining Communites: Grades into various box woodlands in eastern most occurances and into a variety of communities further west including Bladder Saltbush, Lignum, Black Box woodlands and even Mulga shrublands.

Threatening Processes: Although the floristic diversity has been reduced in some locations due to grazing, this community is not threatened by clearing due to its occurrence in hard clay depressions. It is relatively less threatened compared to most woodlands and shrublands of the semi-arid and arid zones. Noogoora Burr (Xanthium occidentale) seeds spread by water form dense infestations after flooding in some areas e.g. Meccoola Creek and fringes of Lake Altibouka in far north western NSW.

Threatening Process List: Hydrology (drainage); Hydrology (impoundment); Salinity; Unsustainable grazing and trampling by stock.

Threat Category: Least Concern. ***Threat/Protected Area Code:*** LC/4a ***Threat Criteria:*** 1; 4; 5.

Planning Controls:

Planning and Management: Protection of key sites from overgrazing and trampling. Enhance flooding to floodplains.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (82; 3; 309; 282; 12; 291; 330; 293; 28; 208; 29; 27; 295; 14; 25; 87; 13; 274; 33; 41; 396). Bayliss, P. (1977) A preliminary resource investigation of Nocoleche Nature Reserve. Unpublished. (NSW National Parks and Wildlife Service: Bourke); Beadle, N.C.W. (1981) The vegetation of Australia. (Cambridge University Press: Cambridge); Davies, R.J.P. (1982) The conservation of major plant associations in South Australia. (Conservation Council of South Australia Incorporated: Adelaide); Dykes, P. (2002) Vegetation communities of the Cobar Shire. Unpublished report. (Department of Land and Water Conservation, Far West Region: Dubbo); 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; Hunter, J.T. & Fallavollita, E. (2003) Vegetation and floristics of the Paroo-Darling National Park - Thilta Karra section. Unpublished report to NSW National Parks and Wildlife Service; Kingsford, R.T. & Porter, J.L. (1999) Wetlands and waterbirds of the Paroo and Warrego Rivers. Pp 23-50 in Kingsford, R.T. Ed. 'A Free flowing River : the ecology of the Paroo River' (NSW National Parks and Wildlife Service: 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; Mills, R. (1984) Mungo National Park Vegetation Map. In vegetation study of Mungo National Park. (NPWS Lower Darling District: Mildura); Morcom, L. (1988) Expedition Sturt May 1988 Sturt National Park, NSW (1988) Part 1 Vegetation studies at Sturt National Park. Botany Group Report. (Australian and New Zealand Scientific Exploration Society); Northern Floodplains Planning Committee (2004) Vegetation communities of the northern floodplains western New South Wales. Book 1: Western Division of the Walgett Shire, Book 2: Brewarrina Shire, Book 3: eastern part of Bourke Shire (NFPC: Walgett); Pickard, J. & Norris, E.H. (1994) The natural vegetation of north-western New South Wales: notes to accompany the 1:1 000 000 vegetation map sheet. Cunninghamia 3(3): 423-464; Playfair, R.M. & Robinson, A.C. (1997) (eds.) A biological survey of the North Olary Plains, South Australia 1995-1997. (Natural Resources Group, Department of Environment and Natural Resources: South Australia); 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; Porteners, M.F., Ashby, E.M. & Benson, J.S. (1997) The natural vegetation of the Pooncarie 1:250 000 map. Cunninghamia 5(1): 139-232; Sattler, P.S. & Williams, R.D. (1999) (eds.) The Conservation Status of Queensland's Bioregional Ecosystems. (Environmental Protection Agency: Brisbane); Scott, J.A. (1992) The natural vegetation of the Balranald - Swan Hill area. Cunninghamia 2(4): 597-652; Westbrooke, M., Leversha, J., Gibson, M., O'Keefe, M., Milne, R., Gowans, S., Harding, C. and Callister, K. (2003). The vegetation of Peery Lake area, Paroo-Darling National Park western New South Wales. Cunninghamia 8(1): 111-128; Westbrooke, M.E. & Miller, J.D. (1995) The vegetation of Mungo National Park, western New South Wales. Cunninghamia 4(1): 63-80; Westbrooke, M.E., Miller, J.D. & Kerr, M.K.C. (1998) The vegetation of the Scotia 1:100 000 map sheet, western New South Wales. Cunninghamia 5(3): 665-684; Westbrooke, M. & Gowans, S. (2006) The vegetation of the Mount Murchison and Wilga areas, Paroo Darling National Park, western New South Wales. Report to NSW NPWS (Centre for Environmental Management, University of Ballarat).

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 160

Common Name: **Nitre Goosefoot shrubland wetland on clays of the inland floodplains**

Scientific Name: *Chenopodium nitrariaceum / Sclerolaena muricata - Sclerolaena stelligera - Malacocera tricornis*

Veg. Comm. ID.: **160** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID160a_Img378ps.jpg Chenopodium nitrariaceum shrubland on the floodplain of Murray-Kulkyne Park (south-east of Mildura, Victoria), Chalka Creek, approx.1 km south of northern River Track entrance to park; 8/10/1987, Peter Smith.

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

Trees: *Eucalyptus largiflorens.*

Shrubs/Vines/Epiphytes: *Chenopodium nitrariaceum; Muehlenbeckia florulenta; Chenopodium auricomiforme; Eragrostis australasica; Lycium australe; Acacia stenophylla; Acacia salicina; Eragrostis australasica; Atriplex nummularia; Lycium australe.*

Ground Cover: *Sclerolaena muricata; Sclerolaena stelligera; Malacocera tricornis; Sclerolaena tricuspis; Omphalolappula concava; Harmsiodoxa blennodioides; Einadia nutans subsp. nutans; Oxalis perennans; Atriplex semibaccata.*

Weed Species: *Hordeum leporinum; Hordeum marinum; Lolium perenne; Avena fatua; Brassica tournefortii; Cirsium vulgare; Echium plantagineum; Erodium cicutarium; Hedypnois rhagadioloides subsp. cretica; Malva parviflora; Medicago polymorpha; Medicago praecox; Onopordum acanthium subsp. acanthium; Sisymbrium irio; Spergularia rubra; Rapistrum rugosum.*

Weediness: Medium (5-15%) with 10-30% cover.

Threatened Plants: Atriplex infrequens; Atriplex sturtii; Dysphania platycarpa; Eleocharis obicis; Stackhousia clementii.

Threatened Fauna: Australian Bustard; Bush Stone-curlew; Pied Honeyeater; Little Pied Bat; Black-necked Stork; Grey Falcon; Brolga; Black-tailed Godwit; Square-tailed Kite; Blue-billed Duck; Redthroat; Long-haired Rat; Painted Snipe; Yellow-bellied Sheathtail-bat; Freckled Duck.

Mean Species Richness: 18±1 (Horner et al. 2003 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Chenopod Shrubland.

Height Class (WH): Tall.

Vegetation Description: Tall shrubland to two metres high, dominated by Nitre Goosefoot (Chenopodium nitrariaceum) often with Black Roly Poly (Sclerolaena muricata). Low shrubs include Sclerolaena stelligera, Soft Horns (Malacocera tricornis) and Atriplex semibaccata; forb species include Omphalolappula concava, Harmsiodoxa blennodioides and Oxalis perennans. Exotic species may be common including the grasses Hordeum leporinum, Hordeum marinum, Lolium perenne and Avena fatua. Common exotic forbs include Brassica tournefortii; Cirsium vulgare; Echium plantagineum; Erodium cicutarium, Hedypnois rhagadioloides subsp. cretica and Medicago polymorpha. Tall shrubs of Cooba (Acacia salicina) and River Cooba (Acacia stenophylla) may be present. Occurs on cracking clay or sandy clay soils in lake beds, low lying plains, drainage depressions and alluvial plains subject to flooding in the arid and semi-arid zones of far western NSW. Widespread but usually found in discrete stands. In some places this community may be derived from a previous Old Man Saltbush shrubland as it generally occurs in highly disturbed sites. Grades into Lignum communities in wetter sites where drainage is impaired. Grub infestation has killed large areas since the 1990s and is a potential major threat to this community.

Level of Classification: Association.

Classification Confidence Level: Medium.

Formation Group: Chenopod (Halophytic) Shrublands of the Inland.

State Veg Map (Keith 2004): *Inland Floodplain Shrublands.*

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

NVIS Major Veg Sub-Groups: *Chenopod shrublands.*

Forest Type (RN 17): *226 - Saltbush (P).*

Authority(s): (Combination of Expert Opinion and Quantitative Data). Defined and mapped for Mungo National Park by Westbrooke & Miller (1995). Floristic Group 12 being part of map units 7 & 8 in Horner et al. (2002) covering part of the Hay Plain. Described from north western NSW by Milthorpe (1991). Noted as a variation within the ID17 (Lignum) in SW NSW by Smith & Smith (1990) being part of community 29, in Porteners (1993) as part of her community 18 and as part of map unit 2 (Black Box) in Scott (1992). Part of the shrubland complex map unit 16 in Kerr et al. (2000). Medium confidence level because is probably a derived community but is recorded in fine scale mapping. Would vary in composition across range from north to south.

Interstate Equivalent(s): Victoria: part of Alluvial Plains Shrubland EVC.

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

Mapping Info: Mapped for Mungo National Park by Westbrooke & Miller (1995). Floristic group 12 being part of map units 7 & 8 in Horner et al. (2002). Generally lumped into other map units in the broad RBG mapping of S/W NSW and Pickard & Norris (1994) for central far west NSW.

Climate Zone: Semi-arid: warm (winter rain); Semi-arid: hot (persistently dry); Arid: hot (persistently dry).

IBRA Bioregion (v6): Broken Hill Complex (1-30%); Channel Country (1-30%); Darling Riverine Plains (1-30%); Murray-Darling Depression (30-70%); Riverina (1-30%).

IBRA Sub-Region: Barrier Range Outwash, Fans and Plains (1-30%); Bulloo Overflow (1-30%); Central Depression (1-30%); Darling Depression (1-30%); Great Darling Anabranch (1-30%); Lachlan (1-30%); Louth Plains (1-30%); Murray Fans (1-30%); Murray Scroll Belt (1-30%); Murrumbidgee (1-30%); Paroo Overflow (1-30%); Paroo Sand Sheets, Cuttaburra-Paroo (1-30%); Pooncarie-Darling (1-30%); Robinvale Plains (1-30%); South Olary Plain, Murray Basin Sands (1-30%); Wilcannia Plains (1-30%).

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

Local Govt. Areas: Balranald (1-30%); Bourke (1-30%); Broken Hill (1-30%); Carrathool (1-30%); Central Darling (1-30%); Conargo (1-30%); Deniliquin (1-30%); Hay (1-30%); Murrumbidgee (1-30%); Unincorporated (1-30%); Wakool (1-30%); Wentworth (1-30%).

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

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Clay.

Great Soil Group: Brown clay; Grey clay.

Soil Texture: Clay loam, sandy; Light medium clay; Sandy clay loam.

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

Landform Elements: Drainage depression; Flood-out; Plain; Scroll plain.

Land Use: Grazing.

Impacts of European Settlement: Increased extent/range.

Pre-European Extent: 50000 ha ±50%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: This community may or may not have been present prior to European settlement. Generally it is considered it is derived from a Old Man Saltbush dominated shrubland.

Current Extent: 100000 ha ±50% or 200% ± 80% of pre-European extent remaining.

Current Extent Comments: (Expert estimate). Mapped as part of chenopod or other communities in Royal Botanic Gardens mapping of north-western and south western NSW. A proportion of the 140000 ha in map units 7 and 8 in Horner et al. (2002) covering part of the Hay Plain. May have increased since European settlement being derived from previous saltbush-dominated communities, however dieback is affecting some stands.

Conservation Reserves: Lachlan Valley NR 25 (E1); Kalyarr NP 470 (E2); Kemendok NR 200 (E3); Kinchega NP 667 (M); Morrisons Lake NR 15 (E3); Oolambeyan NP 49 (M); Willandra NP 1400 (E4); Yanga NP 300 (E3).

Reserves Total Area: 3126 ha. ***No. Representatives in Reserves:*** 8

Protected Area Explanation: Kemendok NR estimated from NSW NPWS (1991). Lachlan Valley NR (prev. Goonawarra NR) from NPWS (undated). Kinchega NP from Westbrooke et al. (2001). Oolambeyan National Park area from Roberts & Roberts (2001). Willandra NP estimate as more than half area mapped as Lignum by Porteners (1993) based on advice from J. Brickhill pers. comm. Morrisons Lake NR estimate from Kerr et al. (2000). Kalyarr NP estimate derived as part of map unit 7 mapped over the reserve by Horner et al. (2002). Yanga NP estimate from DEC (2005).

Secure Property Agreements: None.

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

Protected Current Extent: 3.12% 3126 ha ± 30%. ***No. Representatives in Protected Areas:*** 8

Protected Pre-European Extent: 6.25% which is adequately protected across distribution.

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

Key Sites for Protection: Probably largely a derived community although patches may have been present prior to European settlement. It can be protected by protecting areas of Lignum (ID17) and Old Man Saltbush (IDs158 and 159).

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: Possibly derived from saltbush-dominated communities including Old Man Saltbush shrubland along drainage lines in particular.

Fire Regime: Rarely burnt.

Adjoining Communites: Similar in species composition to Lignum (ID17) and Old Man Saltbush shrubland (ID159) which was once more common. Grades into Black Box communities (ID13 and ID15).

Threatening Processes: A grub infestation caused major decline during the 1990s (M. Driver pers. comm.). While overall it is less

threatened compared to saltbush this dieback should be monitored.

Threatening Process List: Clearing for agriculture; Disease and/or dieback (abnormal); Dryland cropping; Hydrology (drainage); Irrigated cropping (incl. horticulture); Unsustainable grazing and trampling by stock.

Threat Category: Least Concern. ***Threat/Protected Area Code:*** LC/3a ***Threat Criteria:*** 1.

Planning Controls:

Planning and Management: Monitor and address grub dieback.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (237; 289; 155; 216; 216; 137; 14; 247; 13; 9; 33). Gorman, J. (1991) Existing vegetation in Kemendoc Nature Reserve pers. comm. (NSW National Parks and Wildlife Service: Western Region); 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); Kerr, M., Milne, R. & Gibson, M (2000) Vegetation mapping study. Report to Lower Murray Darling Rangeland Management Action Plan inc. and Sunrise 21 Inc. (Centre for Environmental Management, University of Ballarat: Victoria); Kerr, M., Milne, R. & Gibson, M (2000) Vegetation mapping study. Report to Lower Murray Darling Rangeland Management Action Plan inc. and Sunrise 21 Inc. (Centre for Environmental Management, University of Ballarat: Victoria); Milthorpe, P.L. (1991) Vegetation. In: Lands of the North-West Corner of NSW. Technical Report No.12. (Soil Conservation Service of NSW: Dubbo); 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; 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); Westbrooke, M.E. & Miller, J.D. (1995) The vegetation of Mungo National Park, western New South Wales. Cunninghamia 4(1): 63-80.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 12

Common Name: **Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina and Murray Darling Depression Bioregions)**

Scientific Name: *Eleocharis acuta - Pseudoraphis spinescens - Persicaria hydropiper - Lachnagrostis filiformis / Ludwigia peploides subsp. montevidensis - Myriophyllum crispatum*

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

Photo 1: ID12a_Img377ps.jpg Pseudoraphis spinescens-Eleocharis acuta-Centipeda cunninghamii-Persicaria decipiens herbland, War Plain Track, approx.0.5 km from Sand Ridge Road, Barmah State Forest (north-east of Echuca), Victoria, 6/11/1987, Peter Smith.

Characteristic Vegetation: (Quantitative Data)

Trees: *Absent.*

Shrubs/Vines/Epiphytes: *Phragmites australis.*

Ground Cover: *Eleocharis acuta; Pseudoraphis spinescens; Alternanthera denticulata; Amphibromus fluitans; Amphibromus nervosus; Eleocharis pusilla; Ludwigia peploides subsp. montevidensis; Myriophyllum propinquum; Eleocharis pallens; Centipeda cunninghamii; Lachnagrostis filiformis; Paspalum paspalodes; Persicaria hydropiper; Persicaria prostrata; Azolla filiculoides; Damasonium minus; Eleocharis sphacelata; Vallisneria gigantea; Ranunculus inundatus; Gratiola pedunculata; Myriophyllum verrucosum; Pratia concolor; Chenopodium pumilio; Calotis hispidula; Cotula coronopifolia; Polypogon monspeliensis; Juncus usitatus; Carex tereticaulis; Rumex brownii.*

Weed Species: *Hordeum leporinum; Paspalum distichum; Lythrum hyssopifolia; Aster subulatus.*

Weediness: Low (<5%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: 10±7 native spp., 2 exotic spp. (community 20 in Smith & Smith 1990 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Forbland.

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

Vegetation Description: Moist herbland containing a mix of sedges, forbs, grasses and free floating or attached waterplants. Sedge species include Eleocharis acuta and Eleocharis pusilla. Grass species include Spiny Mudgrass (Pseudoraphis spinescens), Blown Grass (Lachnagrostis filiformis) and Amphibromus spp. Forb species include Alternanthera denticulata, Centipeda cunninghamii and Persicaria spp. Floating waterplants include Azolla filiculoides, Myriophyllum spp., Ludwigia peploides subsp. montevidensis and Vallisneria gigantea. Occurs on silty clay loam soils in frequently inundated low lying areas among stands of River Red Gum forest or Black Box forest and woodland, mainly on the floodplains of the Murray, Murrumbidgee, Darling and Lachlan Rivers in the semi-arid (warm) zone of south western NSW. Some areas have been cleared for cropping or horticulture, but a large proportion remains. Altered flooding regimes are the main threat to this community.

Level of Classification: Association.

Classification Confidence Level: High.

Formation Group: Freshwater Wetlands: Inland Aquatic, Swamp and Shrubland Communities.

State Veg Map (Keith 2004): *Inland Floodplain Swamps.*

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

NVIS Major Veg Sub-Groups: *Wet tussock grassland, Herbland, Sedgeland and Rushland.*

Forest Type (RN 17): *231 - Swamp (P).*

Authority(s): (Quantitative Data). Includes community 20 with species listed in Table 1.2 in the floristic plot survey of the Murray River by Smith & Smith (1990) and includes map unit 8 in Pressey et al. (1984) covering the Great Cumbung Swamp on the Murrumbidgee/Lachlan Rivers confluence. Probably map unit 14 (Sedge Swamp) in Fox (1991). This community occurs in open areas within inland riverine forests (River Red Gum) of south-western NSW.

Interstate Equivalent(s): Victoria: possibly similar to EVC 804 Rushy Rieverine Swamp.

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

Mapping Info: Mapped as open areas among and on the edge of River Red Gum forest in vegetation map of Margules & Partners (1990). Fox (1991) map unit 14 for far south corner of NSW. Not plot sampled over its range in NSW.

Climate Zone: Semi-arid: hot (persistently dry).

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

IBRA Sub-Region: Lachlan (1-30%); Menindee (1-30%); Murray Fans (30-70%); Murray Scroll Belt (1-30%); Murrumbidgee (1-30%); Pooncarie-Darling (1-30%).

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

Local Govt. Areas: Balranald (1-30%); Berrigan (1-30%); Carrathool (1-30%); Central Darling (1-30%); Conargo (1-30%); Deniliquin (1-30%); Griffith (1-30%); Hay (1-30%); Jerilderie (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Wakool (1-30%); Wentworth (1-30%).

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

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays.

Great Soil Group: Brown clay; Grey clay; Humic gley.

Soil Texture: Light clay; Silty clay loam.

Landform Patterns: Covered plain; Flood plain.

Landform Elements: Drainage depression; Stream bed; Stream channel.

Land Use: Cropping and Horticulture; Grazing; Water Storage.

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

Pre-European Extent: 25000 ha ±30%. Estimated from pre-European map: part range.

Pre-European Extent Comments: Fox (1991) maps 24400 as map unit 14 as pre-European extent in the Mildura-Ana Branch floodplains but this is coarse and may be an over-estimate. Also occurs extensively along the Murray, Murrumbidgee and other rivers to the east - as community 20 in Smith and Smith (1990).

Current Extent: 20000 ha ±30% or 80% ± 50% of pre-European extent remaining.

Current Extent Comments: (Estimated from a more broadly classified vegetation map). Much of the 13000 ha mapped as Open Areas along the Murray river in Margules & Partners (1990) is this community. Other areas occur on other river systems, for example, Pressey et al. (1984) mapped 1400 ha of this community in the Great Cumbung Swamp. Some areas have been cleared for crops.

Conservation Reserves: Billabong FR 4 (E1); Kemendok NR 20 (E1); Moira Lakes FR 400 (E2); Pollack FR 80 (E1); Sanddune Pine FR 16 (E1); Snake Island FR 1 (E1); Toupna Creek FR 5 (E1); Yanga NP 500 (E3).

Reserves Total Area: 1026 ha. ***No. Representatives in Reserves:*** 8

Protected Area Explanation: Estimates or measurements of areas in Billabong, Toupna, Sanddune Pine, Moira Lakes Flora Reserves and Kemendok Nature Reserve along Murray River have been derived from descriptions Forestry Commission (1989a) and/or by overlaying the distribution of the communities defined by Smith & Smith (1990) with open area map unit in Margules & Partners (1990). Yanga NP estimate from notes 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: 5.13% 1026 ha ± 50%. ***No. Representatives in Protected Areas:*** 8

Protected Pre-European Extent: 4.1% 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: Great Cumbung Swamp. Forests along the Murray River floodplain.

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

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

Variation & Disturbance: Species composition alters with flooding regimes - internal variation ranges from grassland to sedgeland to forbland and may include free floating water plants at times of high water.

Fire Regime: Fire is rare. May burn during droughts.

Adjoining Communites: Grades into ID181 (Reedland) and ID182 (Rushland) near river channels or on the edges of lagoons or ox-bows. Grades into open water wetland (ID238) in billabongs. Grades into River Red Gum forests and Black Box woodlands throughout range.

Threatening Processes: Clearing for crops and horticulture, trampling and grazing by stock, altered flooding regimes and some weed invasion.

Threatening Process List: Hydrology (drainage); Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Least Concern. ***Threat/Protected Area Code:*** LC/4a ***Threat Criteria:*** 1; 5.

Planning Controls:

Planning and Management: Maintain and enhance environmental flows to inland rivers and ensure regular flooding occurs.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (12; 11; 342; 18; 9; 23). 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; 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); Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); 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;.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 47

Common Name: **Swamp grassland wetland of the Riverine Plain**

Scientific Name: *Pycnosorus globosus - Lachnagrostis filiformis - Austrodanthonia duttoniana - Swainsona procumbens / Alternanthera denticulata - Marsilea drummondii - Myriocephalus rhizocephalus*

Veg. Comm. ID.: **47** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID47a_img277pc.jpg Pycnosorus globosus - Austrodanthonia duttoniana - Agrostis avenaceae, near Jerilderie, 1995, J.S Benson.

Photo 2: ID47b_img279pc.jpg Austrodanthonia duttoniana - Eragrostis australasicus swampy grassland, Riverina, 1995, J.S Benson.

Characteristic Vegetation: (Quantitative Data)

Trees: *Generally absent.*

Shrubs/Vines/Epiphytes: *Eragrostis australasica; Teucrium racemosum.*

Ground Cover: *Pycnosorus globosus; Lachnagrostis filiformis; Austrodanthonia duttoniana; Swainsona procumbens; Alternanthera denticulata; Marsilea drummondii; Myriocephalus rhizocephalus; Myriophyllum crispatum; Crassula decumbens var. decumbens; Walwhalleya proluta; Eleocharis pallens; Juncus radula; Ranunculus pentandrus var. platycarpus; Calostemma purpureum; Bulbine semibarbata; Calotis scabiosifolia var. scabiosifolia; Eclipta platyglossa; Myriocephalus rhizocephalus; Rhodanthe corymbiflora; Isolepis hookeriana; Isolepis victoriensis; Austrodanthonia caespitosa; Walwhalleya proluta; Rumex tenax.*

Weed Species: *Arctotheca calendula; Cotula bipinnata; Taraxacum officinale; Medicago truncatula; Juncus articulatus; Trifolium repens; Alopecurus geniculatus; Lolium rigidum.*

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

Threatened Plants: Brachyscome muelleroides (rare); Leptorhynchos scaber (E); Lepidium monoplocoides (E); Swainsona murrayana (restricted ex V).

Threatened Fauna: Brolga.

Mean Species Richness: 19±5 native spp., 6±5 exotic spp. (Benson et al. 1997 in 20x10 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Closed Grassland; Grassland; Open Grassland; Forbland.

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

Vegetation Description: Grassland and forbland dominated by Blowngrass (Lachnagrostis filiformis), Dutton Wallaby Grass (Austrodanthonia duttoniana) and billy button (Pycnosorus globosus). Other common species include Swainsona procumbens, Alternanthera denticulata, Marsilea drummondii, Myriocephalus rhizocephalus, Myriophyllum crispatum, Crassula decumbens var. decumbens, Walwhalleya proluta, Eleocharis pallens, Juncus radula and Ranunculus pentandrus var. platycarpus. Canegrass (Eragrostis australasica) may occur as an overstorey shrub. Weed species include Arctotheca calendula, Cotula bipinnata, Taraxacum officinale, Medicago truncatula and Juncus articulatus. Occurs on grey cracking clay in swamps and depressions on the Riverine Plain in the Riverina Bioregion. More restricted than other grassland types in the region and some areas have been cleared for crops.

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

Formation Group: Grasslands of Freshwater Aquatic Habitats of Periodically Flooded Soils.

State Veg Map (Keith 2004): Inland Floodplain Swamps.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Other tussock grasslands.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Quantitative Data). Community 5 in Benson et al. (1997). Mapped as a general grassland community (community 26) in Porteners (1993).

Interstate Equivalent(s): Victoria: some similarity with EVC125 Plains Grassy Wetland.

Mapped/Modelled: Current extent and pre-European extent not mapped or modelled. ***Plot Sampling:*** Inadequate.

Mapping Info: Sampled by Benson et al. (1997) but not mapped. Mappable from aerial photos with ground checking as this community occurs in depressions.

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

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

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

Botanical Division: South Western Plains (SWP) (>70%).

Local Govt. Areas: Carrathool (1-30%); Conargo (1-30%); Deniliquin (1-30%); Hay (1-30%); Jerilderie (1-30%); Leeton (1-30%); Lockhart (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Narrandera (1-30%); Urana (1-30%).

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

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Clay.

Great Soil Group: Grey clay.

Soil Texture: Heavy clay.

Landform Patterns: Alluvial plain.

Landform Elements: Drainage depression; Plain.

Land Use: Grazing; Water Storage.

Impacts of European Settlement: Minor reduction (<30%) in extent and/or range.

Pre-European Extent: 50000 ha ±50%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Restricted to swampy depressions as documented in the survey by Benson et al. (1997). This estimate ignores the loss of previous shrub species - it is assumed that in pre-European times there was a mosaic of grassland with bladder saltbush shrubland, Old Man Saltbush shrubland and Myall woodland but these have been grazed out.

Current Extent: 25000 ha ±50% or 50% ± 80% of pre-European extent remaining.

Current Extent Comments: (Expert estimate). Porteners (1993) combines all Riverina grasslands under community 26 and mapped 290000 on the Booligal-Hay-Deniliquin-Bendigo 1:250000 map sheets. A larger unmapped area occurs to the east centred on Jerilderie. It is likely that over 500000 ha of grassland of various types occurs on the Riverina Plain (derived largely from Myall woodland and Saltbush shrubland since European settlement. This swampy grassland type is restricted in the area compared to IDs44, 45 and 46.

Conservation Reserves: Oolambeyan NP 90 (E4).

Reserves Total Area: 90 ha. ***No. Representatives in Reserves:*** 1

Protected Area Explanation: Cane Grass is recorded for Oolambeyan NP but not is mapped out by Roberts & Roberts (2001). It is assumed small areas exist as part of map unit 3c in Roberts & Roberts (2001).

Secure Property Agreements: None.

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

Protected Current Extent: 0.36% 90 ha ± 10%. ***No. Representatives in Protected Areas:*** 1

Protected Pre-European Extent: 0.18% 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: Site 43 in Benson et al. (1997) on "Morundah" owned by the Australian Navy contains a number of rare species and a good stand of this community.

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

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

Variation & Disturbance: Time since indundation affects the presence and abundance of some species but perennial species persist.

Fire Regime: Fire is very rare - perhaps every few decades or so.

Adjoining Communites: Grades into other grassland communities (ID44-46) on the Riverine Plain. may also grade into Weeping Myall woodland (ID26).

Threatening Processes: Clearing for cropping, overstocking and pugging, weed invasion and changes hydrology including impoundment and altered flooding and runoff.

Threatening Process List: Clearing for agriculture; Climate change;Hydrology (drainage); Unsustainable grazing and trampling by stock.

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

Planning Controls:

Planning and Management: Protect this grassy wetland from being further cleared under the Murray, Murrumbidgee and Lachlan Catchment Management Action Plans

Listed Under Legislation: Nominated Commonweath EPBC Act.

Recovery Plan: Doesn't exist and not required.

Reference List: (60). Benson, J.S., Ashby, E.M. & Porteners, M.F. (1997) The native grasslands of the Riverine Plain, New South Wales. Cunninghamia 5(1): 1-48;.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 53

Common Name: **Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains**

Scientific Name: *Muehlenbeckia florulenta - Acacia stenophylla / Panicum decompositum - Paspalidium jubiflorum - Juncus aridicola / Eleocharis pallens - Eleocharis plana - Marsilea drummondii - Alternanthera denticulata*

Veg. Comm. ID.: **53** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID53a_img262pc.jpg Marsilea drummonii - Cyperus exaltatus Marsh near Moomin Creek, [AGD66 29°41'35.7"S 149°28'25.2"E], 20/10/01, Jaime Plaza.

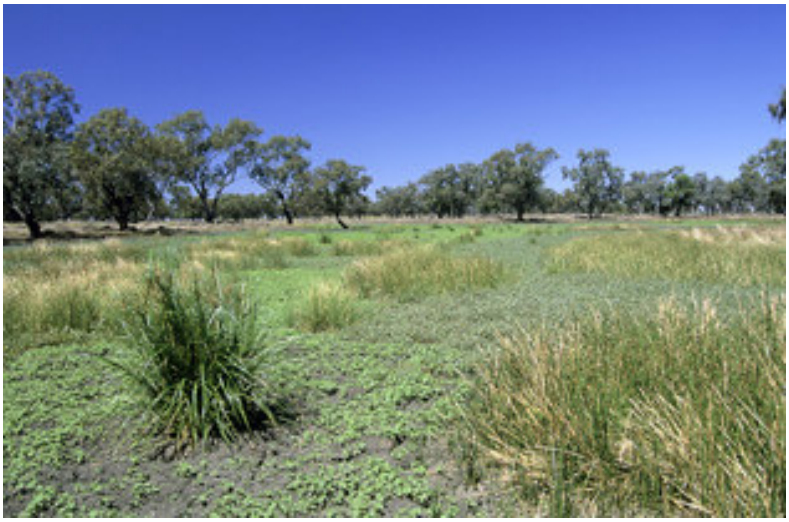


Photo 2: ID53b_Peasley.jpg Sedge-marsh in grassy woodland in the Moree Plains region, 2002, Bruce Peasley.

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

Trees: *Eucalyptus camaldulensis; Casuarina cristata.*

Shrubs/Vines/Epiphytes: *Muehlenbeckia florulenta; Acacia stenophylla; Eremophila bignoniiflora.*

Ground Cover: *Eleocharis pallens; Eleocharis acuta; Eleocharis plana; Marsilea drummondii; Marsilea costulifera; Alternanthera denticulata; Panicum decompositum; Paspalidium jubiflorum; Cynodon dactylon; Eriochloa crebra; Panicum effusum; Chloris truncata; Paspalum distichum; Sporobolus mitchellii; Lachnagrostis filiformis; Leptochloa digitata; Eragrostis elongata; Alternanthera nodiflora; Alternanthera sp. A; Stellaria angustifolia; Ranunculus undosus; Verbena gaudichaudii; Rumex crystallinus; Rumex brownii; Stackhousia muricata; Myriophyllum verrucosum; Damasonium minus; Rorippa eustylis; Juncus aridicola; Juncus subsecundus; Cyperus bifax; Cyperus exaltatus; Fimbristylis dichotoma; Damasonium minus; Diplachne muelleri; Haloragis aspera; Mimulus gracilis; Boerhavia dominii; Pratia concolor; Portulaca oleracea; Ranunculus sessiliflorus var. sessiliflorus; Oxalis exilis; Eclipta platyglossa.*

Weed Species: *Phyla canescens; Xanthium spinosum; Xanthium occidentale; Medicago polymorpha; Silybum marianum; Rapistrum rugosum; Lolium perenne.*

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

Threatened Plants: Swainsona murrayana (ex V restricted); Aponogeton queenslandicus; Dentella minutissima; Eleocharis obicis; Ipomoea diamantinensis.

Threatened Fauna: Grey Grasswren; Magpie Goose; Australian Bittern; Pied Honeyeater; Little Pied Bat; Black-necked Stork; Grey Falcon; Squatter Pigeon; Brolga; Black-tailed Godwit; Square-tailed Kite; Blue-billed Duck; Redthroat; Long-haired Rat; Painted Snipe; Yellow-bellied Sheathtail-bat; Freckled Duck; Masked Owl.

Mean Species Richness: 23±13 (Hunter & Earl 1999 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Sedgeland; Open Sedgeland.

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

Vegetation Description: Low to mid-high sedgeland/grassland dominated by spike rushes including Eleocharis pallens, Eleocharis acuta, Eleocharis plana and Cyperus spp., along with ferns Nardoo (Marsilea drummondii) and Marsilea costulifera, the rushes Juncus subsecundus, Juncus aridicola, the grasses Native Millet (Panicum decompositum), Warrego Grass (Paspalidium jubiflorum), Umbrella Canegrass (Leptochloa digitata) and Rats Tail Grass (Sporobolus mitchellii). Forb species include Rumex spp., Alternanthera spp., Haloragis aspera, Mimulus gracilis, Pratia concolor, Boerhavia dominii and Ranunculus spp. A taller sedge/shrub layer may be present composed of the tall sedge Cyperus exaltatus, and the shrubs Lignum (Muehlenbeckia florulenta), Eremophila bignoniifolia and River Cooba (Acacia stenophylla). Weed species include Lippia (Phyla canescens) and Bathurst Burr (Xanthium spinosum). Scattered trees of River Red Gum (Eucalyptus camaldulensis) and Belah (Casuarina cristata) occur in some locations. Occurs on grey and brown clays including gilgais on low lying flats or depressions on floodplains or on sandplains that regularly flood or fill from local runoff after rain. Distributed throughout the floodplains of the inland plains, particularly in the Darling Riverine Plains Bioregion with small areas in other bioregions. Grades into box woodlands on the plains and River Red Gum along the rivers. Similar to ID241 which has a dominant cover of Acacia stenophylla. Threatened by drainage, less frequent flooding regimes, clearing for crops and invasion of Lippia (Phyla canescens).

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

Formation Group: Freshwater Wetlands: Inland Aquatic, Swamp and Shrubland Communities.

State Veg Map (Keith 2004): Inland Floodplain Swamps.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Wet tussock grassland, Herbland, Sedgeland and Rushland.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Combination of Expert Opinion and Quantitative Data). Includes community 6 in Dick (1990), community 1 in Clarke et al. (1999), community 10 in McGann & Earl (1999) and part of R2 Floodplain Mosaic and part of R9 (Sedge Dominated Wetland) excluding more permanent wetlands with Typha and Phragmites (Sivertsen & Metcalfe 2001). Mapped by Peasley (2001) as all or part of map unit H02 for Moree Plains Shire. Community 5 in Hunter (2006a). Includes floristic group 176 in RACAC (2004). Part of map unit 4h (Swamps) in Cannon et al. for south-east of Moree. Mentioned by Paijmans (1981) and mapped by Johnson & Wilson (1991) for the Macquarie Marshes and by Steenbeeke (1996) and Steenbeeke & Witts (1995) for the lower Macquarie River floodplain. Similar to BVT4 wetlands in Kerr et al. (2003) covering Macquarie-Castlereagh Rivers region. Mapped for pre-European extent in Moree Plains Shire by White (2002a). Western outliers occur along the Paroo River (Eleocharis Swamp unit in Kingsford & Porter (1999). Possibly includes floristic group 179 in RACAC (2004). Sedge Swamp as defined by Jaensch (1999). Includes sites BMW2, BMW9.

Interstate Equivalent(s): Queensland: possibly part of regional ecosystems 6.3.11 in Mulga Lands Bioregion and 11.3.27 in Brigalow Belt South Bioregion (Sattler & Williams 1999); A similar community occurs in north-western Victoria..

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

Mapping Info: Mapped in some areas and some reserves. Pre-European modelling for Moree Plains Shire indicates 22000 ha once occurred for that Shire (White 2002a). Part of the 1650 ha mapped as swamp in Cannon et al. (2002).

Climate Zone: Dry subtropical: moderately dry winter; Semi-arid: hot (persistently dry).

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

IBRA Sub-Region: Bogan-Macquarie (1-30%); Castlereagh-Barwon (>70%); Culgoa-Bokhara (1-30%); Moonie - Barwon Interfluve, Collarenebri Interfluve (1-30%); Northern Outwash (1-30%); Paroo Overflow (1-30%); Pilliga Outwash (1-30%); Lower Slopes (1-30%).

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

Local Govt. Areas: Brewarrina (1-30%); Coonamble (1-30%); Moree Plains (30-70%); Narrabri (1-30%); Unincorporated (1 - 30%); Walgett (1-30%); Warren (1-30%); Gwydir (1-30%).

CMAs: Border Rivers-Gwydir (30-70%); Central West (30-70%); Lachlan (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Namoi (1-30%); Western (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Clay.

Great Soil Group: Brown clay; Grey clay.

Soil Texture: Medium clay.

Landform Patterns: Alluvial plain; Flood plain; Stagnant alluvial plain.

Landform Elements: Backplain; Drainage depression.

Land Use: Cropping and Horticulture; Grazing.

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

Pre-European Extent: 150000 ha ±50%. Estimated from extant vegetation maps: part range.

Pre-European Extent Comments: Estimate only. 22,300 ha mapped as the pre-European extent of sedgelands in the Moree Plains Shire by White (2002). Kerr et al. (2003) reconstruct 42200 ha as the pre-European extent in the Macquarie-Castlereagh region but this includes a number of wetland communities. This community extends to the north of that region. It also occurs in the Western Division.

Current Extent: 50000 ha ±50% or 33% ± 80% of pre-European extent remaining.

Current Extent Comments: (Estimated from mapped extant vegetation: part range). Approximately 10000 ha is mapped by Sivertsen & Metcalfe (2001) including map unit R9 and part of map unit R2. About 4000 ha is mapped along the Macquarie River (Steenbeeke 1996, Steenbeeke & Witts 1995 and Johnson & Wilson 1991) but Sivertsen & Metcalfe (2001) map also covers that area. Peasley (2001) map unit H02 covers 4200 ha of swamps/wetlands in the Moree Plains Shire. Part of the 1650 ha swamp community in Cannon et al. (2002) in areas south of Moree. 21,000 ha modelled for BBS Bioregion in RACAC (2004). Kerr et al. consider 59% remains in the Macquarie-Castlereagh Rivers region. This community also occurs beyond these mapped areas e.g. Culgoa River.

Conservation Reserves: Boomi NR 2 (E1); Budelah NR 17 (E2); Kirramingly NR 9 (M); Macquarie Marshes NR 2000 (E2); Nocoleche NR 500 (E2); Boomi West NR 5 (E1); Boronga NR 3 (E1); Bullala CCAZ1 2 (M).

Reserves Total Area: 2538 ha. ***No. Representatives in Reserves:*** 8

Protected Area Explanation: Macquarie Marshes NR estimated as part of Mixed Marsh and Mixed Grassland vegetation units in Johnson & Wilson (1991) due to descriptions of the Mixed Grassland in Paijmans (1981). Peasley 2001 maps a small area of wetland in Boomi NR but this may be another type of wetland. 9 ha mapped in Kirramingly NR by Clarke et al. (1999). Budelah Nature Reserve measurement from mapping by Peasley (2001). Dick (1990) records 19 ha of this community on the Culgoa floodplain, outside present Culgoa National Park boundary. However, small areas may be inside the National Park. Noted in Nocoleche NR in Bayliss (1977) and J. Porter pers. comm. Boomi, Boomi West and Boronga NR areas mapped in Hunter (2006a). Bullawa NP from C1 in Hunter (2009).

Secure Property Agreements: None.

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

Protected Current Extent: 5.07% 2538 ha ± 30%. ***No. Representatives in Protected Areas:*** 8

Protected Pre-European Extent: 1.69% 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: Floodplains of the western plains. A western example is Bulloo Lake. Most occurrences are on private land. Property agreements should be persued to protect samples of these wetlands that are in good condition.

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

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

Variation & Disturbance: Species composition varies across wide distribituon of this community and levels of or time since inundation. Many plant species are ephemeral.

Fire Regime: Very rarely burns.

Adjoining Communites: Grades into into more permanent wetlands containing species such as Typha and Phragmites (ID181, ID182) or lagoon wetlands (ID238). Similar species composition to River Cooba (Acacia stenophylla) shrubland (ID241). Grades into grassland or chenopod-dominated shrublands or woodlands on plains. Grades into Water Couch (ID204) grassland.

Threatening Processes: Ploughing for cropping remains the major threat to shallow wetlands in this community. Trampling and weed infestation affects most areas particularly by Lippia (Phyla canescens). Altered flooding regimes threaten regularity and degree of flood inundation. Contains the rare species Swainsona murrayensis. May become endangered over time if cultivation continues to expand and flooding is further reduced.

Threatening Process List: Clearing for agriculture; Dryland cropping; Irrigated cropping (incl. horticulture);Hydrology (drainage); Salinity; Unsustainable grazing and trampling by stock.

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

Planning Controls:

Planning and Management: Limit destruction of wetlands for cropping in relevant catchment plans. Ensure environmental flows in rivers that allow sufficient flooding across floodplains. Control of Lippia.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (283; 38; 30; 333; 318; 330; 62; 66; 66; 210; 87; 46; 389; 335; 472). Cannon, G., Cannon, M., Harding, W., McCosker, R., Spunner, B., Steenbeeke, G. & Watson G. (2002) Native vegetation map report No 3: Bellata, Gravesend, Horton and Boggabri 1:100 000 map sheets (NSW Department of Land and Water Conservation); Clarke, P.J., Gardener, M.R., Nano, C.E. & Whalley, R.D.B. (1998) The vegetation and plant species of Kirramingly. (Division of Botany, University of New England: Armidale); Dick, R. (1990) The vegetation of the Wombeira Land System on the floodplains of the Culgoa, Birrie and Narran Rivers in NSW. Occasional Paper 13. (NSW National Parks and Wildlife Service: Hurstville); Jaensch, R. (1999) The status and importance of Queenland's south-western wetlands. Report by Wetlands International-Oceania (Queensland Environmental Protection Agency: Brisbane); 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); Kingsford, R.T. & Porter, J.L. (1999) Wetlands and waterbirds of the Paroo and Warrego Rivers. Pp 23-50 in Kingsford, R.T. Ed. 'A Free flowing River : the ecology of the Paroo River' (NSW National Parks and Wildlife Service: Sydney); McGann, T.D. & Earl, J. (1999) Floristic descriptions of grassland areas on the Moree Plains. Report to the NSW Department of Land and Water Conservation and NSW National Parks and Wildlife Service; Paijmans, K. (1981) The Macquarie Marshes of inland northern New South Wales, Australia. Technical Paper No. 41. (CSIRO Division of Land Use Research: Canberra); Paijmans, K. (1981) The Macquarie Marshes of inland northern New South Wales, Australia. Technical Paper No. 41. (CSIRO Division of Land Use Research: Canberra); Peasley, B. (2001) Vegetation map of Moree Plains Shire. (Department of Land and Water Conservation: Inverell); Sattler, P.S. & Williams, R.D. (1999) (eds.) The Conservation Status of Queensland's Bioregional Ecosystems. (Environmental Protection Agency: Brisbane); Sivertsen, D. & Metcalfe, L. (2001) Northern wheatbelt vegetation mapping. Unpublished 1:250 000 scale vegetation maps and vegetation descriptions covering northern NSW wheatbelt. (NSW National Parks and Wildlife Service: Hurstville); Hunter, J.T. (2006a) Vegetation and floristics of Boronga, Boomi and Boomi West Nature Reserves. Report to NSW Parks and Wildlife Service; Resource and Conservation Assessment Council of NSW (RACAC) (2004) Joint vegetation mapping project, Brigalow Belt South Western Regional Assessment Stage 2 Resource and Conservation Division, Department of Infastructure, Planning and Natural Resources; Hunter, J.T. (2009) Vegetation and florisitics of Bullala National Park. Report to NSW National Parks and Wildlife Service.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 181

Common Name: **Common Reed - Bushy Groundsel aquatic tall reedland grassland wetland of inland river systems**

Scientific Name: *Phragmites australis / Senecio cunninghamii var. cunninghamii / Marsilea drummondii - Centipeda cunninghamii - Persicaria decipiens*

Veg. Comm. ID.: **181** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID181a_BBS-MAY-2008-0407.jpg Common Reed (Phragmites australis) tall reedland on Clear Lake, Narran Lake Nature Reserve [AGD66 29°42'37.4"S 147°26'51.1"E], 1/5/2008, Jaime Plaza.

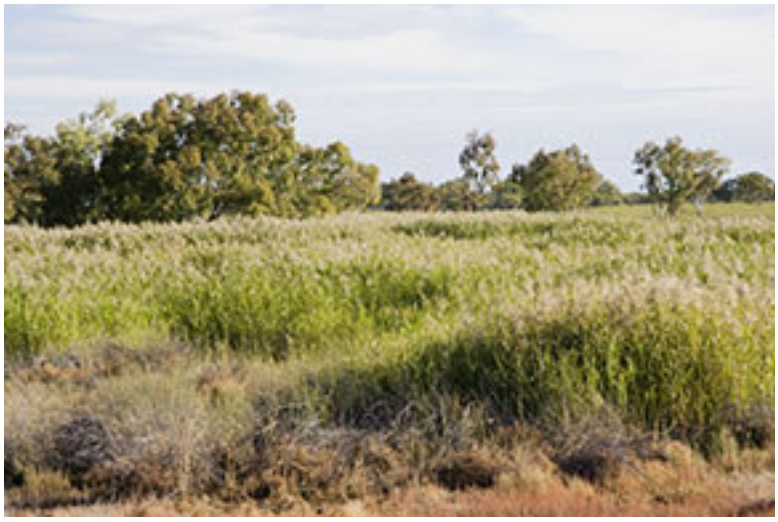


Photo 2: ID181b_Img383ps.jpg Common Reed (Phragmites australis) with River Red Gum (Eucalyptus camaldulensis). Moorook Game Reserve (west of Barmera), approx.2 km from reserve entrance along northern track, South Australia, 4/2/1988, Peter Smith.

Photo 3: ID181c_img055pc.jpg Phragmites australis reedland, Lachlan River, Oxley, [AGD66 34°11'58.2"S 144°06'37.5"E], 12/4/02, Jaime Plaza.

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

Trees: *Eucalyptus camaldulensis.*

Shrubs/Vines/Epiphytes: *Phragmites australis; Typha domingensis; Acacia stenophylla; Muehlenbeckia florulenta.*

Ground Cover: *Senecio cunninghamii var. cunninghamii; Marsilea drummondii; Centipeda cunninghamii; Persicaria decipiens; Juncus flavidus; Pratia concolor; Paspalum distichum; Cyperus gymnocaulos; Vallisneria gigantea; Potamogeton crispus; Lachnagrostis filiformis; Rorippa laciniata; Atriplex semibaccata; Epilobium hirtigerum.*

Weed Species: *Polypogon monspeliensis; Juncus articulatus; Hordeum leporinum; Cotula coronopifolia; Cirsium vulgare.*

Weediness: Medium (5-15%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed (waterbird habitat).

Mean Species Richness: Not assessed.

Rainforest Structure (Webb): Not applicable.

Structure (WH): Closed Reedland; Reedland.

Height Class (WH): Very Tall.

Vegetation Description: Very tall, dense aquatic grassland dominated by Common Reed (Phragmites australis) growing in shallow water to about 0.5 m deep. On drier ground it grades into a forbland dominated by Shrubby Groundsel (Senecio cunninghamii) with a ground cover of Nardoo (Marsilea drummondii), Centipeda cunninghamii, Persicaria decipiens, Juncus flavidus, Pratia concolor, Paspalum distichum and Cyperus gymnocaulos. Floating water plants such as Vallisneria gigantea, Potamogeton crispus and Myriophyllum may be present if water levels are high. Weeds include Polypogon monspeliensis, Hordeum leporinum, Cirsium vulgare and Juncus articulatus. River Red Gum (Eucalyptus camaldulenis) forest often forms a canopy over the top of the stream in which this community occurs. This community occurs on silty-clay, organic soils on the banks and edges of stream channels, ox-bow lakes or other water bodies on the floodplains of the major river systems in western NSW in the semi-arid and temperate (hot summers) climatic zones. Its largest occurrences are in the Macquarie Marshes on the Macquarie River in north central NSW, in the Great Cumbung Swamp situated on the confluence of the Murrumbidgee and Lachlan Rivers in southwestern NSW, and along the western section of the Murray River. Although it may occur in artificial drainage channels, some of its original extent has possibly been affected by drainage and mechanical alteration of stream channels. This community grades into Cumbungi rushland (ID182) in slightly deeper water and in more shallow water into shallow marsh (ID12 and ID53) in small depressions near levees or on stream channel banks.

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

Formation Group: Freshwater Wetlands: Inland Aquatic, Swamp and Shrubland Communities.

State Veg Map (Keith 2004): Inland Floodplain Swamps.

State Landscape (Mitchell 2002): Gwydir Swamps and Lagoons; .

NVIS Major Veg Sub-Groups: Wet tussock grassland, herbland, sedgeland and rushland.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Combination of Expert Opinion and Quantitative Data). Alliance 21.2.3.1 in Beadle (1981 p 552). Equivalent to a combination of map units 6 and 7 for the Great Cumbung Swamp described by Pressey et al. (1984). Mapped as part of map unit 23 in Scott (1992) and Porteners (1993). Mapped in the Macquarie Marshes by Johnson & Wilson (1991). Grades into several other wetland communities within short distances.

Interstate Equivalent(s): South Australia: part of community 9 (Eucalyptus camaldulensis - Phragmites australis) in Smith & Smith (1990); Victoria: Victoria: probably part of EVC292 River Red Gum Wetland of north-western Victoria but also similar to EVC300 Reed Swamp in southern Victoria.

Mapped/Modelled: Current extent partly mapped or modelled. ***Plot Sampling:*** None.

Mapping Info: Mappable with low level aerial photographs but difficult to distinguish from Cumbungi rushland. Great Cumbung Swamp is mapped by Pressey et al. (1994). Macquarie Marshes mapped by Johnson & Wilson (1991). Some other areas have been mapped along other rivers but generally this community is not mapped due to the small extent of its occurrences.

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

IBRA Bioregion (v6): Cobar Peneplain (1-30%); Darling Riverine Plains (1-30%); Mulga Lands (1-30%); Murray-Darling Depression (1-30%); NSW South-western Slopes (1-30%); Riverina (30-70%).

IBRA Sub-Region: Bogan-Macquarie (30-70%); Castlereagh-Barwon (1-30%); Culgoa-Bokhara (1-30%); Great Darling Anabranch (1-30%); Lachlan (1-30%); Lower Slopes (1-30%); Menindee (1-30%); Moonie - Barwon Interfluve, Collarenebri Interfluve (1-30%); Murray Fans (1-30%); Murray Scroll Belt (1-30%); Murrumbidgee (1-30%); Narrandool (1-30%); Nymagee (1-30%); Paroo Overflow (1-30%); Pooncarie-Darling (1-30%); Robinvale Plains (1-30%); Warrambool-Moonie (1-30%).

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

Local Govt. Areas: Albury (1-30%); Balranald (1-30%); Berrigan (1-30%); Bogan (1-30%); Bourke (1-30%); Brewarrina (1-30%); Cabonne (1-30%); Central Darling (1-30%); Conargo (1-30%); Coolamon (1-30%); Coonamble (1-30%); Corowa (1-30%); Greater Hume (1-30%); Deniliquin (1-30%); Dubbo (1-30%); Gilgandra (1-30%); Griffith (1-30%); Hay (1-30%); Jerilderie (1-30%); Leeton (1-30%); Lockhart (1-30%); Moree Plains (1-30%); Narrabri (1-30%); Narrandera (1-30%); Narromine (1-30%); Walgett (1-30%); Warren (1-30%); Warrumbungle (1-30%); Unincorporated (1-30%); Urana (1-30%).

CMAs: Border Rivers-Gwydir (1-30%); Central West (1-30%); Lachlan (1-30%); Lower Murray-Darling (1-30%); Murray (30-70%); Murrumbidgee (1-30%); Namoi (1-30%); Western (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Clay; Silt.

Great Soil Group: Grey clay; Humic gley.

Soil Texture: Loamy peat; Silty clay loam.

Landform Patterns: Anastomotic plain; Flood plain.

Landform Elements: Bank (streambank); Bar (streambar); Drainage depression; Embankment; Levee; Ox-bow; Stream channel.

Land Use: Cropping and Horticulture; Grazing; Water Storage.

Impacts of European Settlement: No significant impacts known.

Pre-European Extent: 30000 ha ±50%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: It is assumed some areas may have been drained and lost but overall this community still exists in

reasonable abundance.

Current Extent: 20000 ha ±50% or 67% ± 80% of pre-European extent remaining.

Current Extent Comments: (Estimated from mapped extant vegetation: part range). Pressey et al. (1984, map units 6 and 7) map 4540 ha of this community in the great Cumbung Swamp. Johnson and Wilson (1991) map over 5000 ha in the Macquarie Marshes. Smaller areas occur in smaller swamps and along other river systems but these have not been mapped due to scale. The extent of this community can change with altered flooding regimes.

Conservation Reserves: Macquarie Marshes NR 3800 (E2); Yanga NP 5 (E3); Narran Lake NR 20 (E3); Gwydir Wetlands SCA 25 (M).

Reserves Total Area: 3850 ha. ***No. Representatives in Reserves:*** 4

Protected Area Explanation: A large area is protected in the Macquarie Marshes Nature Reserve mapped by Johnson & Wilson (1991) in their "Common Reed" and as part of their "Mixed Marsh" map units. Noted in Yanga NP in NSWDEC (2005). Small areas of this community probably occur in other protected areas but they are rarely recorded or mapped. Small areas noted in Narran Lake NR in lignum community in Hunter (2006e) and observed there by Benson (1999-2009, trip 11 stop 25). Gwydir Wetlands SCA from Bowen & Simpson (2009).

Secure Property Agreements: None.

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

Protected Current Extent: 19.25% 3850 ha ± 30%. ***No. Representatives in Protected Areas:*** 4

Protected Pre-European Extent: 12.83% 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: As of 2008 inadequately protected in southwestern NSW. Occurs in the Great Cumbung Swamp and other wetlands along Murray and Murrumbidgee Rivers.

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

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

Variation & Disturbance: Occurs in both lagoons and low flow sections of rivers. The extent of Common Reed can change marketly depending on level of ponding of water. During drought is dies back but can quickly re-establish from rootstock after rain. Its seed dispose readily making it one of the first colonisers of wetlands and a cosmopolitan species.

Fire Regime: Rare. During drought Common Reed may burn.

Adjoining Communites: Grades into Cumbungii (Typha) Rushland in deeper water (ID182) and into shallow marsh communities such as ID12 and ID53 at the base of levees and in low lying depressions. Grades into Lignum shrubland (ID17 in south and ID247 in north) on nearby floodplains. Merges with open water wetland (ID238) in deep water lagoons. Grades into River Red Gum and Black Box communities on higher ground.

Threatening Processes: Drainage of river systems, alterations in stream flows and flooding regimes due to dams, wiers and control of rivier flow mainly for provision of water to increasing areas of crops. Rising salinity may affect some sites.

Threatening Process List: Chemical pollution (incl. herbicides, pesticides);Hydrology (drainage); Hydrology (impoundment); Salinity.

Threat Category: Least Concern. ***Threat/Protected Area Code:*** LC/3a ***Threat Criteria:*** 1.

Planning Controls:

Planning and Management: Protection of habitat - edges of rivers, swamps in catchment management plan and water management plans.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (3; 32; 342; 14; 18; 13; 9; 399; 308; 486). Beadle, N.C.W. (1981) The vegetation of Australia. (Cambridge University Press: Cambridge); Johnson, W. & Wilson, R. (1991) Macquarie Marshes vegetation map. Unpublished. (NSW National Parks and Wildlife Service: Hurstville); NSW Department of Environment and Conservation (2005) New Area Investigation Report: Yanga. Unpublished Report (DEC: Dubbo); 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; 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); Hunter, J.T. (2006e) Vegetation and floristics of Narran Lake Nature Reserve. Report to NSW Parks and Wildlife Service DECC NSW; Benson, J.S. (1999-2009) Unpublished field note books recording species at various locations in western NSW. (Royal Botanic Gardens and Domain Trust: Sydney); Bowen, S. & Simpson, (2009) Changes in extent and condition of the vegetation communities of the Gwydir wetlands and floodplain 1996-2008. Report for the NSW Wetland Recovery Program (NSW Department of Environment and Climate Change: Sydney).

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 182

Common Name: **Cumbungi rushland wetland of shallow semi-permanent water bodies and inland watercourses**

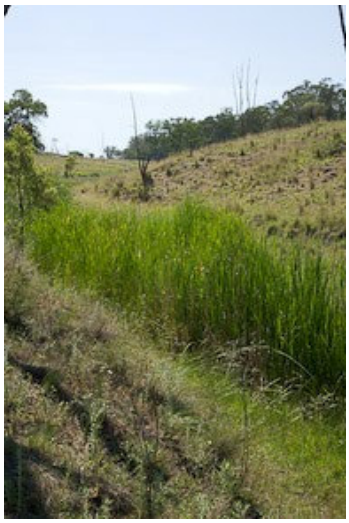
Scientific Name: *Typha domingensis / Senecio cunninghamii var. cunninghamii - Juncus flavidus / Centipeda minima var. minima - Pratia concolor - Ludwigia peploides subsp. montevidensis*

Veg. Comm. ID.: **182** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID182a_img015pc.jpg Typha domingensis rushland, Nowranie Creek on Lake Urana-Berrigan Rd, [AGD66 35°23'27.9"S 146°05'27.3"E], 9/4/02, Jaime Plaza.

Photo 2: ID182b_img056pc.jpg Typha domingensis rushland, Lachlan River, Oxley, [AGD66 34°11'58.2"S 144°06'37.5"E], 12/4/02, Jaime Plaza.

Photo 3: ID182c_BBSNov07_1480.jpg Cumbungi (Typha) rushland in small creek on the Warialda to Graman Road, NSW north-western slopes [AGD66 29°32'4.26"S 150°42'29.94"E], 20/11/2007, Jaime Plaza.



Characteristic Vegetation: (Qualitative Estimate)

Trees: *Absent.*

Shrubs/Vines/Epiphytes: *Typha domingensis; Phragmites australis; Muehlenbeckia florulenta.*

Ground Cover: *Senecio cunninghamii var. cunninghamii; Juncus flavidus; Centipeda minima var. minima; Pratia concolor; Ludwigia peploides subsp. montevidensis; Vallisneria gigantea; Eleocharis acuta; Cyperus gymnocaulos; Damasonium minus; Marsilea drummondii; Ranunculus inundatus; Persicaria decipiens; Lythrum hyssopifolia; Potamogeton crispus; Potamogeton tricarinatus; Juncus usitatus; Juncus articulatus; Ranunculus sceleratus; Cynodon dactylon; Pspalum distichum; Leptochloa digitata; Eragrostis parviflora; Rumex brownii; Azolla filiculoides; Paspalidium aversum; Lachnagrostis filiformis.*

Weed Species: *Juncus articulatus, Ranunculus sceleratus; Polypogon monspeliensis; Phyla canescens; Trifolium repens.*

Weediness: Low (<5%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: Not assessed.

Rainforest Structure (Webb): Not applicable.

Structure (WH): Closed Rushland; Rushland.

Height Class (WH): Very Tall.

Vegetation Description: Very tall, dense rushland dominated by Narrow-leaved Cumbungi (Typha domingensis) often with Shrubby Groundsel (Senecio cunninghamii var. cunninghamii) and Lignum (Muehlenbeckia florulenta). Few plant species are present. Wetland forbs generally include Persicaria spp., Centipeda minima var. minima and Pratia concolor along with waterplants such as Ludwigia peploides subsp. montevidensis and Vallisneria gigantea. Some grass species may be present such as Lachnagrostis filiformis, Paspalum distichum and Cynodon dactylon. Sedges (Cyperus, Eleocharis) and the rush Juncus flavidus may also be present. This community occurs in shallow water growing in grey, brown or black (organic) clay soils in semi-permanent water bodies including streams and ox-bow lakes (billabongs) on the floodplains of the major river systems of western NSW. Occurs in deeper water than Common Reed (Phragmites australis) reedland (ID181) but they share a number of associate species. Some natural occurrences may have been destroyed by drainage of rivers and swamps, while the creation of artificial habitats such as irrigation channels may have increased its range in other areas. as of 2005 Cumbungi was poorly represented in protected areas over its range.

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

Formation Group: Freshwater Wetlands: Inland Aquatic, Swamp and Shrubland Communities.

State Veg Map (Keith 2004): Inland Floodplain Swamps.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Wet tussock grassland, herbland, sedgeland and rushland.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Expert Opinion). Alliance 21.2.3.2 in Beadle (1981 p 552). Equivalent to map unit 10 in Pressey et al. (1984). Part of map unit 23 in Scott (1992) and Porteners (1993). Mapped for the Macquarie Marshes by Johnson and Wilson (1991). Part of Streambank Complex for lower Macquarie River region in Steenbeeke (1996). Noted in Mid-Lachlan RVPC (1999). Cumbungi occurs in deeper water than Common Reed (ID181) but they share some species and may or may not be present together in the same location.

Interstate Equivalent(s): Victoria: probably part of EVC292 River Red Gum Wetland of north-western Victoria but also similar to EVC300 Reed Swamp in southern Victoria.

Mapped/Modelled: Current extent partly mapped or modelled. ***Plot Sampling:*** None.

Mapping Info: Mappable with low level aerial photographs but difficult to distinguish from Common Reed. Mapped for the Great Cumbung Swamp by Pressey et al. (1984). Generally not mapped in botanic surveys due to scale and location in wetlands.

Climate Zone: Semi-arid: warm (winter rain); Semi-arid: hot (persistently dry); Arid: hot (persistently dry).

IBRA Bioregion (v6): Darling Riverine Plains (1-30%); Mulga Lands (1-30%); Murray-Darling Depression (1-30%); NSW South-western Slopes (1-30%); Riverina (30-70%).

IBRA Sub-Region: Bogan-Macquarie (1-30%); Castlereagh-Barwon (1-30%); Culgoa-Bokhara (1-30%); Great Darling Anabranch (1-30%); Lachlan (1-30%); Menindee (1-30%); Moonie - Barwon Interfluve, Collarenebri Interfluve (1-30%); Murray Fans (1-30%); Murray Scroll Belt (1-30%); Murrumbidgee (30-70%); Narrandool (1-30%); Nymagee (1-30%); Pooncarie-Darling (1-30%); Robinvale Plains (1-30%); Warrambool-Moonie (1-30%).

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

Local Govt. Areas: Albury (1-30%); Balranald (1-30%); Berrigan (1-30%); Bogan (1-30%); Bourke (1-30%); Brewarrina (1-30%); Cabonne (1-30%); Carrathool (1-30%); Central Darling (1-30%); Conargo (1-30%); Corowa (1-30%); Greater Hume (1-30%); Deniliquin (1-30%); Dubbo (1-30%); Gilgandra (1-30%); Griffith (1-30%); Gwydir (1-30%); Hay (1-30%); Jerilderie (1-30%); Lachlan (1-30%); Leeton (1-30%); Moree Plains (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Narrabri (1-30%); Narrandera (1-30%); Narromine (1-30%); Wagga Wagga (1-30%); Wakool (1-30%); Walgett (1-30%); Warren (1-30%); Wentworth (1-30%); Unincorporated (1-30%); Urana (1-30%).

CMAs: Border Rivers-Gwydir (1-30%); Central West (1-30%); Lachlan (1-30%); Lower Murray-Darling (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Namoi (1-30%); Western (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Clay; Silt.

Great Soil Group: Grey clay; Humic gley.

Soil Texture: Clayey sand; Hemic peat; Loam; Medium heavy clay.

Landform Patterns: Flood plain.

Landform Elements: Lagoon; Lake; Ox-bow; Stream channel.

Land Use: Cropping and Horticulture; Water Storage.

Impacts of European Settlement: No significant impacts known.

Pre-European Extent: 40000 ha ±70%. Estimated from extant vegetation maps: part range.

Pre-European Extent Comments: It is assumed that some areas have been drained and lost but overall this community still exists in reasonable abundance, albeit in small stnads scattered along inland rivers and creeks.

Current Extent: 30000 ha ±50% or 75% ± 90% of pre-European extent remaining.

Current Extent Comments: (Estimated from mapped extant vegetation: part range). Pressey et al. (1984) mapped 1120 ha in Great

Cumbung Swamp. Johnson and Wilson (1991) map 528 ha in the Macquarie Marshes. This community is found in numerous patches along inland river systems and canals. It is a dynamic community and its extent would fluctuate depending on flooding regimes and climate patterns.

Conservation Reserves: Macquarie Marshes NR 400 (E2).

Reserves Total Area: 400 ha. ***No. Representatives in Reserves:*** 1

Protected Area Explanation: Macquarie Marshes NR area estimated from Johnson & Wilson (1991) Cumbungi map unit but with additional areas added from their Mixed Marsh map unit. This community may be represented in other protected areas but the scale of vegetation mapping and assessment often overlooks it.

Secure Property Agreements: None.

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

Protected Current Extent: 1.33% 400 ha ± 50%. ***No. Representatives in Protected Areas:*** 1

Protected Pre-European Extent: 1% 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: Great Cumbung Swamp probably contains the best stands of thios community in NSW. It also occurs along the Murray and Murrumbidgee Rivers.

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

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

Variation & Disturbance: Typha changes its biomass as water levels in streams and lakes recede or rise. Underground rhizomes allow it to survive the drying out of swamps during dry times. Its seed is easily dispersed so it can rapidly colonize lagoons or slow flowing canals.

Fire Regime: Cumbungi may occasionally burn when it drys out as thje wetlands in which it occurs dry out but it tends not to burn when it is in deep water.

Adjoining Communites: Grades into Common Reed Reedland (ID181) in slightly shallower water, into shallow marsh such as ID12 in semi-permanent wetlands and into free floating and attached waterplant communities in deeper lagoons (ID238).

Threatening Processes: Drainage and river regulation may affect the extent of this community. However, new habitats such as canals may provided extra habitat for Typha and some of its associate species. In fact it has become a "weed" in some of these. Exotic species threaten some areas and they include Juncus articulatus, Ranunculus sceleratus and Polypogon monspeliensis.

Threatening Process List: Chemical pollution (incl. herbicides, pesticides);Hydrology (drainage); Hydrology (impoundment); Weed (exotic) invasion.

Threat Category: Least Concern. ***Threat/Protected Area Code:*** LC/4a ***Threat Criteria:*** 1; 4.

Planning Controls:

Planning and Management: Maintain flooding regimes to inland river systems and associated swamps. Protect some sites from trampling from domestic stock. Management of aquatic weeds.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (3; 32; 67; 14; 18; 13; 159). Beadle, N.C.W. (1981) The vegetation of Australia. (Cambridge University Press: Cambridge); Johnson, W. & Wilson, R. (1991) Macquarie Marshes vegetation map. Unpublished. (NSW National Parks and Wildlife Service: Hurstville); Mid-Lachlan Regional Vegetation Committee (1999) Plan Draft Mid-Lachlan Regional Vegetation Management Plan for Public Exhibition. (Mid-Lachlan RVC: Forbes); 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; 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; Steenbeeke, G. (1996) Vegetation mapping of the lower Macquarie floodplain, upstream of the Macquarie Marshes, Macquarie Marshes Management Strategy. (NSW Department of Land and Water Conservation: Dubbo);.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 238

Common Name: **Permanent and semi-permanent freshwater lakes wetland of the inland slopes and plains**

Scientific Name: *Eleocharis sphacelata - Bolboschoenus medianus - Carex fascicularis / Lemna disperma - Azolla filiculoides - Myriophyllum crispatum - Potamogeton tricarinatus*

Veg. Comm. ID.: **238** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID238a_Img384mp.jpg Flooded Lignum shrubland (Muehlenbeckia florulenta), Hay Plain, Mirrool Creek, Tributaries of the Murrumbidgee River, NSW Hay Plain; 2003, M.F. Porteners.

Characteristic Vegetation: (Qualitative Estimate)

Trees: *Absent.*

Shrubs/Vines/Epiphytes: *Eleocharis sphacelata; Bolboschoenus medianus; Carex fascicularis; Typha orientalis; Phragmites australis.*

Ground Cover: *Lemna disperma; Lemna trisulca; Azolla filiculoides; Azolla pinnata; Myriophyllum crispatum; Myriophyllum verrucosum; Myriophyllum simulans; Myriophyllum papillosum; Myriophyllum striatum; Wolffia australiana; Spirodela polyrhiza; Potamogeton tricarinatus; Ludwigia peploides subsp. montevidensis; Ottelia ovalifolia subsp. ovalifolia; Marsilea drummondii; Elatine gratioloides; Persicaria decipiens; Alternanthera denticulata; Lachnagrostis filiformis; Centipeda cunninghamii; Centipeda minima var. minima; Calystegia sepium; Mentha australis; Vallisneria gigantea.*

Weed Species: *Eichhornia crassipes; Glinus lotoides; Heliotropium europaeum; Cirsium vulgare; Phyla canescens.*

Weediness: Medium (5-15%) with >30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Brolga, Whistling Duck.

Mean Species Richness: Not assessed.

Rainforest Structure (Webb): Not applicable.

Structure (WH): Forbland; Open Forbland; Open Sedgeland.

Height Class (WH): Low.

Vegetation Description: Low open forbland or sedgeland in open water bodies dominated on the water surface by free floating, submerged unattached or submerged attached aquatic plant species. Free floating species include Azolla, Wolffia, Lemna, Vallisneria gigantea and Spirodela spp. Submerged species include Myriophyllum spp. and Potamogeton spp. growing in water about 150 cm deep. Submerged species with floating leaves include Ludwigia peploides. Tall sedges such as Eleocharis sphacelata may be present. This community grades into tall rushland dominated by Typha spp. or tall reedland dominated by Phragmites australis. Many wetland species disperse readily and therefore occur over large geographical ranges - others are more restrictive. Water Hyacinth (Eichhornia crassipes) is a problem weed in the lower Murray River and in some sections of the Darling River system. Occurs in freshwater ox-bow lakes and permanent lakes on the floodplains of the inland river systems usually on clay or humic gley soils with substantial organic content. This community is very broadly classified to cover inland floodplain systems in south-eastern Australia. It could be divided with more floristic data and analysis. It differs in species composition from the open water wetlands on the tablelands and coast in NSW. It grades into Cumbungi (ID181), Common Reed (ID182), Water Couch (ID204) and marsh (ID53) wetlands. On drier ground it grades into River Red Gum, Black Box and Coolabah woodlands and forests. Many wetlands have been degraded or eliminated by agriculture through drainage, chemical and nutrient pollution, sedimentation and in southern NSW, salinity.

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

Formation Group: Freshwater Wetlands: Inland Aquatic, Swamp and Shrubland Communities.

State Veg Map (Keith 2004): *Inland Floodplain Swamps.*

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

NVIS Major Veg Sub-Groups: *Freshwater, dams, lakes, lagoons and aquatic plants.*

Forest Type (RN 17): *235 - Water Surfaces (P).*

Authority(s): (Expert Opinion). Section 21.2.2 in Beadle (1981). A broad classification at sub-formation level of open water such as natural lakes and lagoons that contain a range of aquatic free floating and anchored water plants. Excludes artifical dams or canals. Includes map unit 10 in Pressey et al. (1994) and some of map unit H02 in Peasley (2001) for Moree region. As of 2009, more survey work is required to improve the classification of these wetlands.

Interstate Equivalent(s): Victoria: EVC172: Floodplain Wetland Complex and similar to EVC334 Billabong Wetland; Queensland: possible part of regional ecosystem 11.3.27 (Sattler & Williams 1999).

Mapped/Modelled: Current extent and pre-European extent not mapped or modelled. ***Plot Sampling:*** None.

Mapping Info: Maps of inland open water wetands may assist in mapping this community. Very poorly plot sampled in NSW as of 2005. Not mapped over most of its range except in broad "open water" map unit classes in some areas.

Climate Zone: Dry subtropical: moderately dry winter; Temperate: no dry season (hot summer); Semi-arid: warm (winter rain); Semi-arid: hot (persistently dry); Arid: hot (persistently dry).

IBRA Bioregion (v6): Brigalow Belt South (1-30%); Darling Riverine Plains (1-30); Mulga Lands (1-30%); Murray-Darling Depression (1-30%); NSW South-western Slopes (1-30%); Riverina (30-70%); Simpson-Strzelecki Dunefields (1-30%).

IBRA Sub-Region: Bogan-Macquarie (1-30%); Bulloo Overflow (1-30%); Castlereagh-Barwon (1-30%); Culgoa-Bokhara (1-30%); Great Darling Anabranch (1-30%); Lachlan (1-30%); Lachlan Plains (1-30%); Louth Plains (1-30%); Lower Slopes (1-30%); Menindee (1-30%); Murray Fans (1-30%); Murray Scroll Belt (1-30%); Murrumbidgee (1-30%); Northern Outwash (1-30%); Paroo Overflow (1-30%); Paroo Sand Sheets, Cuttaburra-Paroo (1-30%); Pilliga Outwash (1-30%); Pooncarie-Darling (1-30%); Robinvale Plains (1-30%); South Olary Plain, Murray Basin Sands (1-30%); Strzelecki Desert, Western Dunefields (1-30%); Wilcannia Plains (1-30%).

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

Local Govt. Areas: Albury (1-30%); Balranald (1-30%); Berrigan (1-30%); Bland (1-30%); Bogan (1-30%); Bourke (1-30%); Brewarrina (1-30%); Cabonne (1-30%); Carrathool (1-30%); Central Darling (1-30%); Cobar (1-30%); Conargo (1-30%); Coolamon (1-30%); Coonamble (1-30%); Cootamundra (1-30%); Corowa (1-30%); Cowra (1-30%); Deniliquin (1-30%); Dubbo (1-30%); Forbes (1-30%); Gilgandra (1-30%); Greater Hume (1-30%); Griffith (1-30%); Gundagai (1-30%); Gunnedah (1-30%); Gwydir (1-30%); Harden (1-30%); Hay (1-30%); Inverell (1-30%); Jerilderie (1-30%); Junee (1-30%); Lachlan (1-30%); Leeton (1-30%); Lockhart (1-30%); Mid-Western Regional (1-30%); Moree Plains (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Narrabri (1-30%); Narrandera (1-30%); Narromine (1-30%); Temora (1-30%); Unincorporated (1-30%); Wagga Wagga (1-30%); Wakool (1-30%); Walgett (1-30%); Warren (1-30%); Warrumbungle (1-30%); Weddin (1-30%); Wellington (1-30%); Wentworth (1-30%); Young (1-30%).

CMAs: Border Rivers-Gwydir (1-30%); Central West (1-30%); Lachlan (1-30%); Lower Murray-Darling (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Namoi (1-30%); Western (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays.

Great Soil Group: Grey clay; Humic gley.

Soil Texture: Clay loam.

Landform Patterns: Flood plain; Meander plain; Stagnant alluvial plain; Terrace (alluvial).

Landform Elements: Backplain; Dam; Doline; Drainage depression; Lagoon; Lake; Ox-bow; Stream bed.

Land Use: Cropping and Horticulture; Grazing.

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

Pre-European Extent: 1000000 ha ±50%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Estimate only. This includes the original open water areas of inland NSW including billabongs etc that would have contained free floating and floating, attached plant species.

Current Extent: 400000 ha ±50% or 40% ± 80% of pre-European extent remaining.

Current Extent Comments: (Expert estimate). Kingsford et al. (2004) map about 295000 ha of "Freshwater Lake" wetlands in inland NSW. Many original open water areas have been drained or now lack flooding regimes that replenish them. Human structures such as canals and dams are not included.

Conservation Reserves: Billabong FR 19 (E1); Macquarie Marshes NR 300 (E3); Moira Lakes FR 664 (E1); Morrisons Lake NR 180 (E2); Peacock Creek FR 5 (E2); Pollack FR 6 (E1); Willandra NP 100 (E4); Yanga NP 130 (E2).

Reserves Total Area: 1404 ha. ***No. Representatives in Reserves:*** 8

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. Macquarie Marshes NR estimate from map and descriptions in Paijamans (1981) but this may be inaccurate. Morrison's Lake NR from advice from J. Brickhill pers. comm. Willandra NP estimate by J Benson to cover billabongs there. Yanga NP from lake unit in Scott (1992). May be in Gwydir Wetlands reserve.

Secure Property Agreements: None.

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

Protected Current Extent: 0.35% 1404 ha ± 50%. ***No. Representatives in Protected Areas:*** 8

Protected Pre-European Extent: 0.14% 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: River systems and floodplains and throughtout western NSW but particularly along the Murray River, the Great Cumbung Swamp and the Macquarie Marshes.

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

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

Variation & Disturbance: There are large natural fluctuations in species composition or abundance due to changes in water levels, persistence or water and changes in either nutrient or salinity levels. Some species reproduce vegetatively, others by seed that survives through dry times in the soil, others do both.

Fire Regime: Does not burn due to presence of water unless sites dry out completely.

Adjoining Communites: Grades into Cumbungi (ID181), Common Reed (ID182), Water Couch (ID204) and marsh (ID53) wetlands. On drier ground it grades into River Red Gum, Black Box and Coolabah woodlands and forests.

Threatening Processes: Water extraction from major rivers has led to altered flooding patterns on floodplains. Some billabongs have been silted up due to erosion. Pollution and salinity have affected some areas. Water Hyacinth (Eichhornia crassipes) is a threat to some areas.

Threatening Process List: Clearing for agriculture; Dryland cropping; Chemical pollution (incl. herbicides, pesticides); Irrigated cropping (incl. horticulture); Hydrology (disruption of natural flooding regimes); Hydrology (drainage); Nutrient changes through fertilizers or runoff; Salinity; Sedimentation; Soil erosion, water: gully, tunnel, landslips; Soil erosion, water: sheet erosion; Unsustainable grazing and trampling by stock; Unsustainable grazing by introduced animals; Weed (exotic) invasion.

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

Planning Controls:

Planning and Management: Maintain environmental flows that ensure flooding regimes are appropriate for maintaining open water bodies such as lagoons and ox-bow lakes. Control agricultural and urban pollution of water bodies.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (3; 216; 331; 66; 210; 18; 87; 13). Beadle, N.C.W. (1981) The vegetation of Australia. (Cambridge University Press: Cambridge); Kerr, M., Milne, R. & Gibson, M (2000) Vegetation mapping study. Report to Lower Murray Darling Rangeland Management Action Plan inc. and Sunrise 21 Inc. (Centre for Environmental Management, University of Ballarat: Victoria); Kingsford, R.T., Brandis, K., Thomas, R.F., Crighton, P., Knowles, E. & Gale, E. (2004) Classifying landform at broad spatial scales: the distribution and conservation of wetlands in New South Wales, Australia. Marine and Freshwater Research 55: 17-31; Paijmans, K. (1981) The Macquarie Marshes of inland northern New South Wales, Australia. Technical Paper No. 41. (CSIRO Division of Land Use Research: Canberra); Peasley, B. (2001) Vegetation map of Moree Plains Shire. (Department of Land and Water Conservation: Inverell); 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); Sattler, P.S. & Williams, R.D. (1999) (eds.) The Conservation Status of Queensland's Bioregional Ecosystems. (Environmental Protection Agency: Brisbane); Scott, J.A. (1992) The natural vegetation of the Balranald - Swan Hill area. Cunninghamia 2(4): 597-652;.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 335

Common Name: **Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South-western Slopes Bioregion**

Scientific Name: *Phragmites australis - Typha domingensis / Poa labillardierei var. labillardierei - Carex appressa - Juncus homalocaulis - Rumex brownii*

Veg. Comm. ID.: **335** ***Original Entry:*** J.S. Benson 14/03/2007

Photo 1: ID335a_SWS0507160.jpg Poa labillardierei - Phragmites australis - Typha - Juncus swamp on alluvial organic soil in a valley near Walla Walla east of Rye Park in the upper Lachlan River catchment, [AGD66 34°32 833'S 148°57.007'E], 29/5/2007, Jaime Plaza.

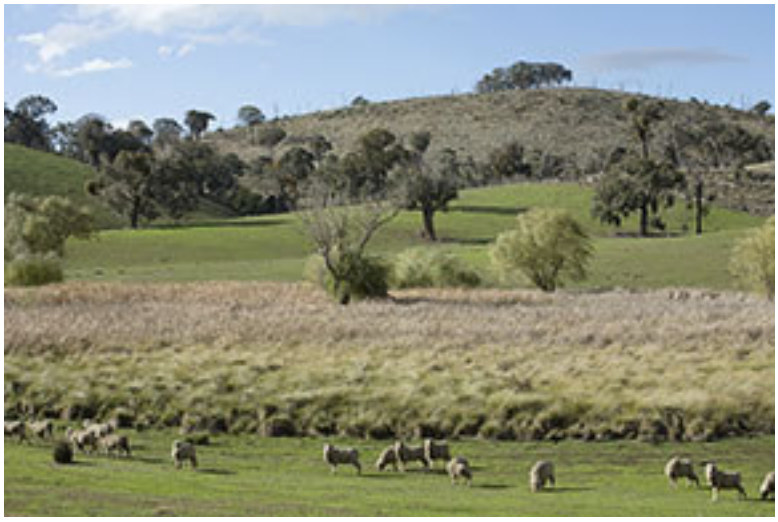
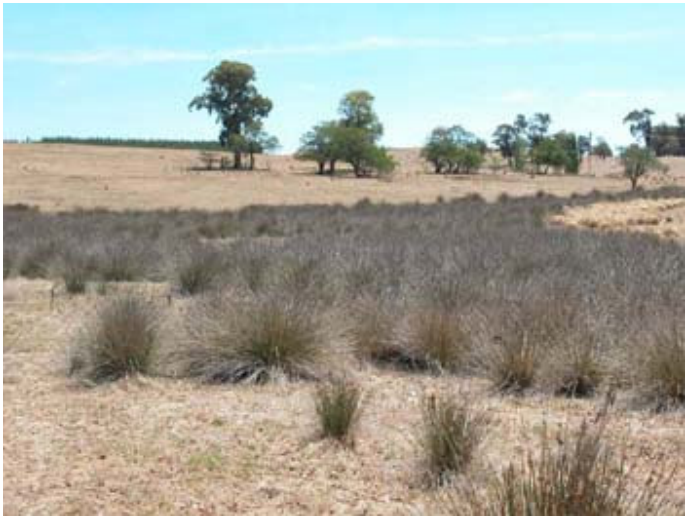


Photo 2: ID335b_benson.jpg Carex appressa sedgeland on drainage flat on Boorowa - Reids Flat Road, [AGD66 34°20.527'S 148°50.337'E], 13/2/2007, J.S. Benson.

Photo 3: ID335c_benson.jpg Disturbed saline watercourse dominated by the weed Juncus acutus subsp. acutus with Poa, Cynodon on Salt Water Creek on the Boorowa-Rugby Road NSW SW Slopes, [AGD66 34°23.977'S 148°45.407'E], 13/2/2007, J.S. Benson.



Characteristic Vegetation: (Qualitative Estimate)

Trees: *Eucalyptus blakelyi; Eucalyptus melliodora.*

Shrubs/Vines/Epiphytes: *Phragmites australis; Typha domingensis; Acacia dealbata; Harmogia densifolia.*

Ground Cover: *Poa labillardierei var. labillardierei; Carex appressa; Juncus homalocaulis; Rumex brownii; Juncus fockei; Juncus holoschoenus; Acaena ovina; Cynodon dactylon; Microlaena stipoides var. stipoides; Aristida ramosa var. ramosa; Geranium neglectum; Geranium retrorsum; Dichopogon fimbriatus; Caesia parviflora var. parviflora; Xerochrysum viscosum; Arthropodium milleflorum; Microtis unifolia.*

Weed Species: *Juncus acutus subsp. acutus; Phalaris aquatica; Cirsium vulgare; Salix alba var. alba; Salix babylonica.*

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

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: Not assessed.

Rainforest Structure (Webb): Not applicable.

Structure (WH): Sedgeland; Open Sedgeland.

Height Class (WH): Mid-High.

Vegetation Description: Tall tussock grassland to mid-high sedgeland to rushland or reedland dominated by tussock snow grass Poa labillardierei var. labillardierei, sedges including Carex appressa, rushes such as Juncus homalocaulis and Juncus fockei. In wetter areas a taller layer of waterplants including the Common Reed (Phragmites australis) and bulrush (Typha domingensis) may be present. Other grass species include Microlaena stipoides var. stipoides and Cynodon dactylon. Forbs species include Rumex brownii, Acaena ovina, Geranium neglectum, Geranium retrorsum, Dichopogon fimbriatus, Caesia parviflora var. parviflora, Xerochrysum viscosum and Arthropodium milleflorum. Shrubs are sparse but Acacia dealbata or Acacia mearnsii species may be present along with Harmogia densiflora and Leptospermum spp.. The trees Blakely's Red Gum (Eucalyptus blakelyi) or Yellow Box (Eucalyptus melliodora) may border the swamp or overhang small swamps that line narrow creeks. Degraded areas of this community are often dominated by exotic weed species such as Sharp Rush (Juncus acutus), Willow (Salix spp.) and Phalaris spp. These weed-infested areas are common in the Boorowa - Young districts often on saline soils. It is difficult to discern the original composition of these valley flat wetlands but they may have been wetter and dominated by reeds and rushes. Occurs on silty or peaty clay loam with high levels of organic material on alluviums derived from a range of substrates along watercourse where sediment has accumulated to form valley flats or where springs may feed valley soaks in the Upper Slopes sub-region of the NSW SW Slopes Bioregion and adjoining parts of the South Eastern Highlands Bioregion. Grades into ID79 River Red Gum woodland along watercourses to the west and into Blakely's Red Gum and box woodland upslope from the watercourses. Some floristic affiliation to bogs at higher altitude on the tablelands. Most of the sites dominated by Carex appressa are highly degraded due to heavy stock grazing and now contain a limited species composition. Very few sites are in near-natural condition. As of 2007, this community requires more sampling to improve its definition and description. Due to threats and loss of extent it is an endangered plant community.

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

Formation Group: Freshwater Wetlands: Coast, Tablelands and Slopes Sedgeland Swamps.

State Veg Map (Keith 2004): Inland Floodplain Swamps.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Wet tussock grassland, herbland, sedgeland and rushland.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Expert Opinion). Species for various locations in Benson (1999-2009). Limited species listed for near Dananbilla NR by M. Doherty pers. comm. 1998). Probably includes most of Vegetation Group 162 in Gellie (2005).

Interstate Equivalent(s): Unknown.

Mapped/Modelled: Current extent and pre-European extent not mapped or modelled. ***Plot Sampling:*** Inadequate.

Mapping Info: Not mapped as of 2007 but some unpublished documentation has been produced. The swamps occur in small patches but could be mapped through fine scale API.

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

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

IBRA Sub-Region: Upper Slopes (>70%); Murrumbateman (1-30%); Bondo (1-30%); Crookwell (1-30%).

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

Local Govt. Areas: Young (1-30%); Blayney (1-30%); Boorowa (1-30%); Cowra (1-30%); Harden (1-30%); Yass Valley (1-30%); Upper Lachlan (1-30%).

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

MD Basin: Yes.

Substrate Mass: Alluvium; Sedimentary rocks; Volcanic rocks.

Lithology: Alluvial loams and clays; Gravel.

Great Soil Group: Alluvial soil; Peaty podzol.

Soil Texture: Silty clay loam; Silty loam.

Landform Patterns: Hills; Plateau.

Landform Elements: Drainage depression; Swamp; Valley flat.

Land Use: Grazing.

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

Pre-European Extent: 6000 ha ±50%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Restricted to soaks, springs or valley flats along creeks in the Upper Slopes Sub-region of the NSW SWS Bioregion and the adjoining South Eastern Highlands Bioregion.

Current Extent: 1000 ha ±30% or 17% ± 50% of pre-European extent remaining.

Current Extent Comments: (Expert estimate). Most of the original valley flat wetlands are so degraded that they should assessed as destroyed.

Conservation Reserves: None.

Reserves Total Area: 0 ha. ***No. Representatives in Reserves:*** 0

Protected Area Explanation: Small patches may be in some protected areas but these have not mapped or documented as of 2007.

Secure Property Agreements: None.

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

Protected Current Extent: Not known to be protected. ***No. Representatives in Protected Areas:*** 0

Protected Pre-European Extent: 0% 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: Probably was previously more common in the Upper Slopes Sub-region in the NSW SW Slopes Bioregion and on the western side of the South Eastern Highlands Bioregion but it is now degraded or eliminated due to grazing, drainage and increased salinity. An outstanding example of this wetland occurs east of Rye Park on the property Walla Walla with other sites occurring along Grassy Creek in this region. Also, along Tarcutta Creek and near Koorawatha. Requires surveys to document sites in the best condition warranting protection.

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: Varies consderably over range due to edaphic and hydrologocal differences and the degree of grazing. Few intact sites remain due to grazing pressure and drainage of swamps. Better sites contain tussock snow grass, reeds and rushes but degraded sites contain Carex appressa and the introduced Juncus acutus. Many occurrences are highly degraded by stock grazing and invaded by exotic species including Juncus acuta. The common Reed (Phragmites australis) and Bullrush (Typha) occur where water is more abundant along channels or in ponds.

Fire Regime: Rarely burns as is often surrounded by cleared land and in any case contains a relatively moist soil. If peat exists in the soil it could burn and thus could have long term impacts on the wetlands.

Adjoining Communites: Grades into Blakely's Red Gum - Yellow Box woodland and other box eucalypt woodlands occurring uplsope from valley flats. West of Tumbarumba may grade into Broad-leaved Sally woodland (ID285). Some similarities to the upper Murray and Murrumbidgee wetlands (ID336) but the latter has more waterplant species including greater numbers of Eleocharis. Some similarities to the highly restricted ID465 that occurs in the southern BBS Bioregion.

Threatening Processes: Threatened by past clearing and drainage along with continual overgrazing, gully soil erosion, nutrification and weed invasion with salinity in some regions. Some original wetlands are now dominated by the introduced spiky rush Juncus acutus subsp. acutus that thrives in saline areas.

Threatening Process List: Clearing for agriculture; Clearing for pine plantations; Hydrology (disruption of natural flooding regimes); Nutrient changes through fertilizers or runoff; Salinity; Soil erosion, water: gully, tunnel, landslips; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Endangered. ***Threat/Protected Area Code:*** E/5b ***Threat Criteria:*** 4; 5; 1.

Planning Controls:

Planning and Management: Protect riparian vegetation from stock grazing and trampling. Property agreements with landholders would be the most feasible way to protect this community because it mainly occurs on private land. Maintain water flows in creeks. Requires weed control at some sites of Willow and the difficult to control Juncus acutus.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist, but required.

Reference List: (353; 308; 353). 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; Benson, J.S. (1999-2009) Unpublished field note books recording species at various locations in western NSW. (Royal Botanic Gardens and Domain Trust: Sydney); 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.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 336

Common Name: **Rush - Sedge - Common Reed mainly lentic channel wetland of the Upper Murray and mid-Murrumbidgee River floodplains in the NSW South-western Slopes Bioregion**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis / Phragmites australis / Carex tereticaulis - Juncus flavidus - Lachnagrostis filiformis - Eleocharis acuta*

Veg. Comm. ID.: **336** ***Original Entry:*** J.S Benson 9/02/2007

Photo 1: ID336a_T18Webster.jpg Intermittent wetland T14 with Juncus, Carex spp., Myriophyllum sp. and River Red Gums in the upper Murray River valley, 2003, Rick Webster.

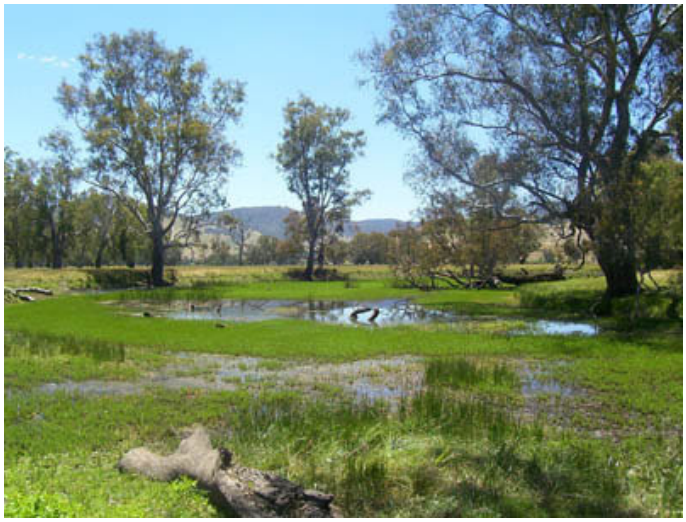


Photo 2: ID336b_T29aWebster.jpg Upper Murray River wetland T29a in its dry phase, 2003, Rick Webster.

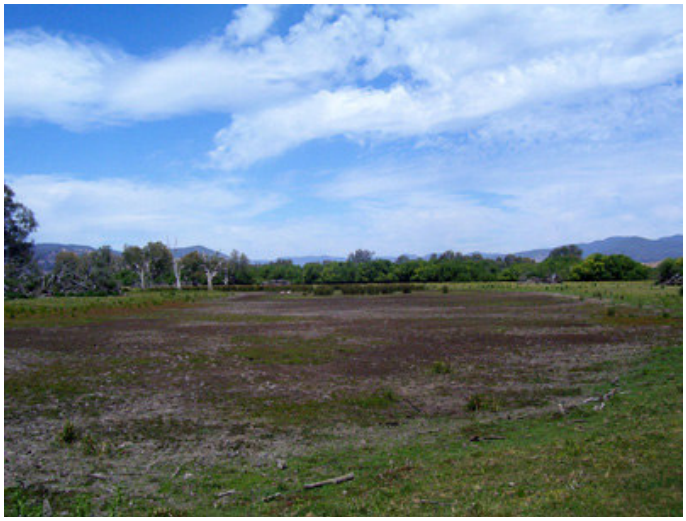
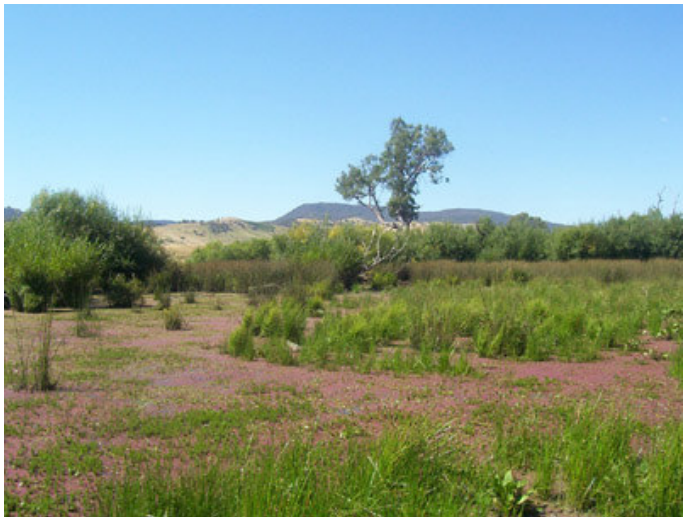


Photo 3: ID336c_T14Webster.jpg Disturbed upper Murray River intermittent wetland with Willow, Elaeocharis, Myriophyllum, 2003, Rick Webster.



Characteristic Vegetation: (Qualitative Estimate)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis.*

Shrubs/Vines/Epiphytes: *Acacia dealbata.*

Ground Cover: *Phragmites australis; Carex tereticaulis; Juncus flavidus; Lachnagrostis filiformis; Eleocharis acuta; Cyperus lucidus; Pseudoraphis spinescens; Juncus ingens; Carex appressa; Carex fascicularis; Carex breviculmis; Potamogeton tricarinatus; Gratiola peruviana; Triglochin procerum; Eleocharis sphacelata; Typha domingensis; Poa labillardierei var. labillardierei; Microlaena stipoides var. stipoides; Elymus scaber var. scaber; Bothriochloa macra; Walwhalleya proluta; Myriophyllum caput-medusae; Myriophyllum crispatum; Myriophyllum verrucosum; Ranunculus inundatus; Cyperus exaltatus; Poa labillardierei var. labillardierei; Azolla filiculoides; Mentha pulegium; Cynodon dactylon; Alisma plantago-aquatica; Persicaria prostrata; Vallisneria gigantea.*

Weed Species: *Salix alba var. alba; Salix babylonica; Salix nigra; Salix x rubens; Salix fragilis var. fragilis; Rumex crispus; Poa annua; Lolium perenne; Phalaris aquatica.*

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

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: Not assessed.

Rainforest Structure (Webb): No applicable.

Structure (WH): Sedgeland; Open Sedgeland; Rushland; Open Rushland.

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

Vegetation Description: Tall to mid-high sedgeland, rushland or reedland dominated by sedges such as Eleocharis acuta, Cyperus lucidus, Cyperus exaltus, Carex tereticaulis and Carex appressa with rushes such as Juncus flavidus and Juncus ingens and Common Reed (Phragmites australis). On drier areas Blown Grass Lachnagrostis filiformis may be common. In ponding zones attached or floating aquatic plants occur such as Myriophyllum spp., Potamogeton tricarinatus, Gratiola peruviana, Triglochin procerum and Eleocharis sphacelata occur. Spiny Mudgrass (Pseudoraphis spinescens) occurs in some wetlands especially along the Murray River. In areas protected from heavy grazing with shallow water, tall Common Reed (Phragmites australis) may dominate. This reed may have been more widespread before grazing and drainage. On the edges of the wetland "dryland" grasses may grow such as Poa labillardierei var. labillardierei, and Microlaena stipoides var. stipoides grow. This community occurs on alluvial soils in ox-bow lakes and drainage depressions of rivers in a floodplain landform pattern in the upper reaches of the Murray and mid-reaches of the Murrumbidgee Rivers in the southern part of the NSW South-western Slopes Bioregion extending into Victoria. The majority of the wetlands could be termed "lentic channel" developed from abandoned river channels formed when channels change course. Most wetlands dry out during droughts but some stay wet due to connections with the main river via gravel beds. The wetlands require periodic flooding every few years to maintain their floristic composition. Several hundred wetlands occur ranging in size from less than a hectare to tens of hectares. Since European settlement some wetlands have been drained or impacted by levee banks. Most are grazed by cattle which has impacted on floristic composition whereby palatable specis such as Phragmites australis and some sedges have been eaten out. Several species of Willow (Salix) have invaded some of the wetlands and along with invasion by Blackberry (extoic Rubus spp.), weeds represent a major management problem. Besides weeding programs, the main management requirements of wetlands are continued regular flooding and management of the tiiming and intensity of stock grazing. Some wetlands should be protected and fenced off alltogether.

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

Formation Group: Freshwater Wetlands: Coast, Tablelands and Slopes Sedgeland Swamps.

State Veg Map (Keith 2004): Inland Floodplain Swamps.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Wet tussock grassland, herbland, sedgeland and rushland.

Forest Type (RN 17): 231 - Swamp (P).

Authority(s): (Combination of Expert Opinion and Quantitative Data). A broad floristic classification that covers the hundreds of seasonal/intermittent floodplain mainly lentic wetlands in the Upper Riverina region (upper Murray and mid-Murrumbidgee Rivers). These are described in Webster & Davidson (2003) for Section 1 of the Murray River in Pressey (1986). Management descriptions are provided in Webster (2007). Includes some of the ground cover descriptions for wet sites along the Murray Valley in Stelling (1998). Probably includes Vegetation Group 214 Murray River Floodplain Wetlands in Gellie (2005). Similar to EVC 292 in Victoria (Victorian DSE 2006)

Interstate Equivalent(s): Victoria: similar to EVC 292: Red Gum Swamp with some possible overlap with EVC 804: Rushy Riverine Swamp.

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

Mapping Info: The swamps have been mapped in the upper Murray and Murrumbidgee River floodpalins by Webster et al.(2006). Some species lists are available for some wetlands but there has not been rigorous plot sampling as of 2007.

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

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

IBRA Sub-Region: Bondo (1-30%); Upper Slopes (>70%).

Botanical Division: South Western Slopes (SWS) (>70%).

Local Govt. Areas: Gundagai (1-30%); Greater Hume (30-70%); Tumut (1-30%); Tumbarumba (1-30%).

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

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays.

Great Soil Group: Alluvial soil; Humus podzol.

Soil Texture: Silty clay loam; Silty loam.

Landform Patterns: Flood plain.

Landform Elements: Drainage depression; Ox-bow.

Land Use: Cropping and Horticulture; Grazing.

Impacts of European Settlement: Major alteration of species composition.

Pre-European Extent: 3000 ha ±30%. Estimated from pre-European map: part range.

Pre-European Extent Comments: Gellie (2005) models 375 ha but his map did not cover full extent nor was it detailed mapping. Webster & Davidson (2003) map hundreds of wetands over 1 ha in size. Pressey maps about 4000 ha of wetlands in section 1 of the Murray River 9above the Hume Weir but this may involve som man-made wetlands.

Current Extent: 1500 ha ±30% or 50% ± 50% of pre-European extent remaining.

Current Extent Comments: (Expert estimate). Most of the wetlands greater than 1 ha have been mapped by Webster & Davidson (2003) but some of these are ID238 i.e. open ponds. R. Webster (pers. comm.) considers that some clearing and draining has occurred but the majority of wetlands remain but in a degraded state due to grazing.

Conservation Reserves: None.

Reserves Total Area: 0 ha. ***No. Representatives in Reserves:*** 0

Protected Area Explanation: May be in VCA084. Otherwise poorly protected area in NSW as of 2007 although some wetlands occur on public land on travelling stock reserves.

Secure Property Agreements: VCA084 VCA 4 (E4).

Secure PAs Total Area: 4 ha. ***No. Representatives in Secure Property Agreements:*** 1

Protected Current Extent: 0.26% 4 ha ± 10%. ***No. Representatives in Protected Areas:*** 1

Protected Pre-European Extent: 0.13% 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: Several hundred small wetlands areas occur on floodplains in the upper Murray Valley and in the mid-Murrumbidgee River floodplains mainly on private land (Webster & Davidson 2003). Some wetlands are in good condition such those on Karara and Appleton TSRs. See wetland mapping (Webster & Davidson 2003) and report on management (Webster 2007).

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

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

Variation & Disturbance: The floristic composition varies due to depth of water, time since last inundation and distrubance history. Heavy grazing by cattle has reduced abundance of palatable sedgtes and Common Reed leaving less palatable Juncus and Carex dominating many of the wetlands.

Fire Regime: These wetlands rarely burn and most are surrounded by heavily grazed exotic or derived native grassland. The last fire on the upper Murray Floodplain was 1952 (Webster 2007). Fire is not an appropriate management tool.

Adjoining Communites: Grades into River Red Gum forest (ID5 or ID79) on higher areas on alluvial floodplain flats. Grades into deeper ponds or lagoons that are probably part of ID238. In the mid-Murrumbidgee and at higher altitudes this wetland type grades into sphagnum bogs that are classified as a separate community. It also may grade into the Poa labillardieri - Carex appressa valley flat (ID335) wetland in the Lachlan River catchment that tend to occur on drier sites.

Threatening Processes: Considered to be Near Threatened due to changes in vegetation structure and composition caused by grazing and weed invasion. Tumut River and Murrumbidgee river wetlands have been impacted by dams controlling the timing of water release. Also, flooding events may become less regular through changes in rainfall patterns due to climate change. Few if any sites are in protected areas as of 2007. Webster & Davidson (2003) assessed half of 300 wetlands as in moderate condition with none pristine.

Threatening Process List: Clearing for agriculture; Climate change; Chemical pollution (incl. herbicides, pesticides); Hydrology (disruption of natural flooding regimes); Hydrology (drainage); Irrigated cropping (incl. horticulture); Nutrient changes through fertilizers or runoff; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Near Threatened. ***Threat/Protected Area Code:*** NT/5b ***Threat Criteria:*** 4.

Planning Controls:

Planning and Management: See Webster (2007) for recommendations on management. Allow natural flooding to occur across floodplains. This occurs every 3 to 5 years on average (Webster 2007). Fence off some areas to prevent trampling by stock although grazing by stock can control willows. Grazing should not occur in spring Summer when the wetlands are full. Annual control of Blackberries is required in higher altitude wetlands. Willows area major threat and should be removed. Avoid further drainage of swamps. Negotiate secure property agreements with landholders for lands containing wetlands that are in good condition.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (341; 353; 364; 366; 367; 368). 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; Victorian Department of Sustainability and Environment (2006) EVC / Bioregion benchmark for vegetation qualtiy assessment. Web site (Victorian DSE: Melbourne); Webster, R. & Davidson, I. (2003) inventory of wetlands within the Riverina highlands regional vegetation region. Report to Riverina Highlands Regional Vegetation Committee (Ecosurveys Pty Ltd: Deniliquin); Webster, R. (2007) Management history of high conservation value wetlands in the upper Murray management unit of the Murray CMA. Report to NSW Murray Wetlands Working Group Inc. (Ecosurveys Pty Ltd: Deniliquin); Pressey, R.L. (1986) Wetlands of the River Murray below lake Hume - RMC Environmental Report 86/1 (River Murray Commission: Canberra).