A SURVEY OF HYDROLOGICAL CHANGES TO WETLANDS OF THE MURRUMBIDGEE RIVER

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ABSTRACT

The floodplain (1974 flood height) of the Murrumbidgee River between Wagga Wagga and Hay Weir in New South Wales encompasses 174,700 ha. In this study area, open water wetlands occupy 2,005 ha and river red gum wetlands occupy 45,075 ha. A total of 570 ha of the river red gum has been killed by increased inundation. Fifty one percent of the open water wetlands (62% of total area) have been affected by local hydrological change. Water levels in 11% of open water wetlands (24% of total area) are now heavily controlled, and 31% (36% of total area) have been made permanent. The water regimes of Murrumbidgee wetlands are less altered than those of Murray River wetlands, but their extent of local hydrological control is similar to wetlands of the Namoi River. Future wetland surveys should record the degree and type of control of their water regimes.

INTRODUCTION

Most rivers in the Murray-Darling system are regulated by dams on their headwaters, and weirs along their length (Walker 1985, Close 1990, Jacobs 1990). Flows of water in these regulated rivers are determined by storage and release of water for downstream irrigation. Direct impacts of river regulation on riverine and floodplain wetlands are not well understood, but river flows and hence wetland flooding can be substantially altered, and often are reduced (Leitch 1989, McCosker and Duggin 1992, Thomson 1992). Effects of river regulation on wetlands of the Murray-Darling Basin are difficult to determine because flow regimes in the rivers vary naturally. Furthermore, few wetlands have been gauged, and the volumes of water that enter them at different flood heights are not known.

In addition to indirect effects of regulation on river flows, water regimes in many Murray-Darling wetlands are now controlled directly. This local control includes : impounding water behind weirs and in off-river storages for downstream irrigation; storing water for local irrigation, for either stock or domestic purposes; and holding tailwater from irrigation. With the exceptions of the Murray and Namoi Rivers (Pressey 1986, Green and Dunkerley 1992), the types and extent of local control of water regimes in the riverine and floodplain wetlands in the Murray-Darling system are not known.

The purpose of this study was to determine the types and extent of local hydrological control of wetlands along the Murrumbidgee River between Wagga Wagga and Hay. The study is part of a larger investigation into the effects of controlling water regimes on the breeding and abundance of waterbirds.

STUDY AREA AND METHODS

The study area was in southern inland New South Wales, and extended east along the Murrumbidgee River from Hampden Bridge at Wagga Wagga to Hay Weir (Figure 1). The lateral boundaries were the northern and southern extents of the 1974 flood (one in 80 years at Wagga Wagga and one in 45 years at Hay (Sinclair Knight and Partners Pty Ltd 1977a,b)). The Murrumbidgee River is in the Murray-Darling drainage basin, which is the largest externally draining catchment in Australia. The Murrumbidgee rises in the Snowy Mountains and joins the Murray River 880 km westwards from its source (Sinclair Knight and Partners Pty Ltd 1977b).

Three broad categories of wetland (open water, live river red gum *Eucalyptus camaldulensis* Dehn., and dead river red gum) were defined, and mapped using aerial photographs. The wetlands were

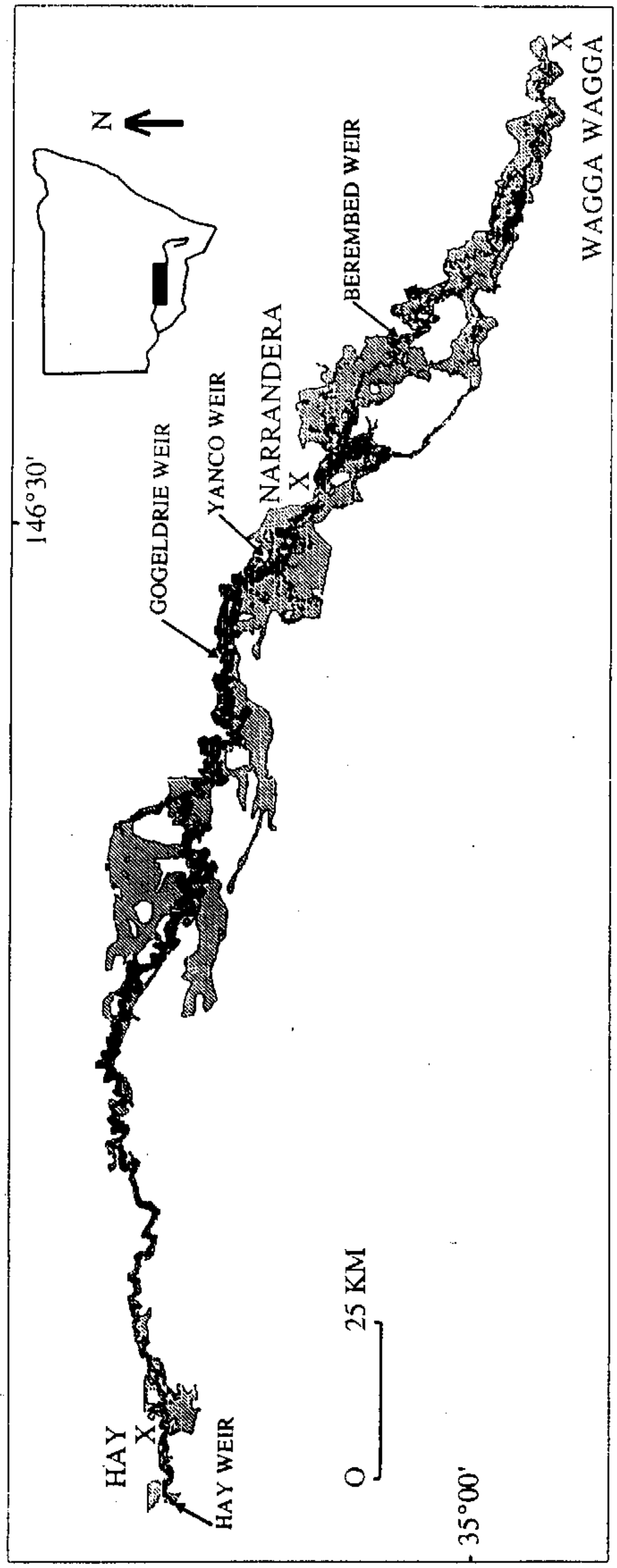

Figure 1 Map of the study area (the stippled area is the floodplain of the Murrumbidgee River between Wagga Wagga and the present Hay Weir inundated by the 1974 flood (Water Resources Commission 1977) with open water and river red gum wetlands both shown as black.

classified according to their degree of water control, permanency of surface water and type of land tenure (freehold, Crown land). Open water wetlands were discrete basins or depressions with clearly defined edges, which filled with water from the river, local runoff or artificially, and were devoid of trees. They did not necessarily contain water at the time of survey. The minimum dimensions for recognition of open water wetlands were > 1 ha in area and > 50 m in width.

The boundaries of open water and live river red gum wetlands were determined from the most recent black and white aerial photos available from the Department of Lands (1980 for Wagga Wagga, 1988 elsewhere; scale of 1:45,000 or 1:50,000). Ground truthing and surveys of landholders were used to verify the presence of open water wetlands and to determine boundaries of the live river red gum wetlands, if these were at all unclear on the aerial photographs. The distribution of cleared river red gum was not determined. Patches of dead river red gum were discrete, while live river red gum was almost continuous along the length of the river. The location of Crown land was obtained from 1:25,000 and 1:50,000 topographic maps (see Appendix), and from maps of waterside reserves produced by Department of Lands (1:50,000 scale).

The boundaries of the study region, of the wetland types, and of Crown and freehold land were transferred from ground truthed aerial photos to 1:25,000 and 1:50,000 topographic maps. These boundaries were then digitised and entered into the geographical information system, Environmental Resource Mapping System (ERMS). Three separate overlays were used : study region, wetland type and land tenure. ERMS was used to determine the area of live river red gum within the study region, according to land tenure.

Dead river red gum was not visible from aerial photos, so its presence was determined from ground survey and surveys of landholders. ERMS did not have sufficient resolution to give accurate measurements of areas of open water or dead river red gum. Therefore, open water and the larger areas of dead river red gum were measured directly from aerial photos using a dot matrix grid. Most dead river red gum occurred in narrow bands on the sides of heavily controlled open water wetlands. These bands were too thin to measure their areas directly from aerial photos. Instead, their widths were estimated on the ground, and then multiplied by their length, measured from aerial photos, to give final areas.

The wetlands were placed into hydrological categories, according to their degree and type of water control, and whether their surface water was permanent or not. Prior to development, all wetlands in the study area would have been intermittent (see Buxton 1967), as the uncontrolled ones still are today (Appendix). Officers from the Wagga Wagga, Leeton and Hay offices of the Department of Water Resources were consulted to ascertain the types of water control in wetlands within their administrative areas. Further information was obtained from landholders, both private and government (Forestry Commission).

Four categories of water control were identified. Each category was further subdivided according to the type of control. The categories and sub-categories were:

Category 1 = No control. The water regime is not locally manipulated.

Category 2a = Slight control. Water is pumped into the wetland from the river, diverted into it by a weir, or enters during floods. The water is then pumped out of the wetland for irrigation, stock or domestic purposes. Water may or may not be retained in the wetland by a bank (regulator, earth or concrete wall). The water in the wetland may or may not retain its connection with the river, but the natural hydrology of the wetland overrides artificial control of its water regime. The wetland usually dries out (not necessarily annually) and its water level falls slowly (weeks to months) and predictably.

Category 2b = Slight control. Same degree of control as Category 2a but the wetland receives used irrigation water (tailwater).

Category 3a = Medium control. Same type of control as Category 2a, but greater degree. Control of the water level in part, or all, of the site overrides the natural hydrology of the wetland. Water levels may vary erratically over short periods (days to weeks), or move more slowly (changing over weeks to months) and predictably. Surrounding river red gum floods in high rivers. The wetland rarely, or never, dries entirely.

Category 3b = Medium control. Same degree of control as Category 3a except the wetland receives irrigation tailwater.

Category 3c = Medium control. The wetland has been drained, or blocked off from the river. It receives water only in very high floods.

Category 4a = Heavy control. Same type of control as Category 3a but greater degree. All of the wetland, including surrounding river red gum (if present), is subject to water level control. The wetland is either a weir pool, or an off-river storage fed by a canal. It never dries entirely, and the water level may go up or down erratically over short periods (days to weeks).

Category 4b = Heavy control. The wetland has been created artificially.

Live river red gum was placed in the No Control Category, while dead river red gum was placed in the relevant Control Category from 3a to 4b. River red gum is killed by impoundment of water (see Margules and Partners Pty Ltd *et al.* 1990), therefore dead gums indicate medium or heavy control of the water regime.

RESULTS

An area of 174,700 ha between Wagga Wagga and Hay Weir was inundated by the 1974 flood (Figure 1). Of this, open water wetlands cover 2,005 ha (Tables 1 and 2), and river red gum (dead and alive) covered 45,075 ha (Tables 3 and 4). The area of dead river red gum was 570 ha (Tables 3 and 4). The rest of the floodplain consisted of pasture (including an unknown area of cleared red gum), black box *Eucalyptus largiflorens* F. Muell. and irrigated land. The hydrology of 51% of open water wetlands (62% of total area) was locally

Table 1 Area in hectares (number) of open water wetlands according to the degree of hydrological control and permanency of surface water, on the floodplain (1974 flood height) of the Murrumbidgee River between Hampden Bridge in Wagga Wagga and Hay Weir.

Control Category		Permanent	Intermittent	Total
None	1	0(0)	762(41)	762(41)
Slight	2a	91(2)	41(5)	132(7)
	2b	0(0)	61(6)	61(6)
Medium	3a	83(8)	349(5)	432(13)
	3b	50(5)	0(0)	50(5)
	3c	0(0)	80(1)	80(1)
Heavy	4a	233(8)	0(0)	233(8)
	4b	255(3)	0(0)	255(3)
Total controlled		712(26)	531(17)	1243(43)
Total		712(26)	1293(58)	2005(84)

controlled to some extent (Table 1). Of these, 13% (24% of total area) were heavily controlled (Table 1). Thirty one percent of open water wetlands (36% of total area) have been made permanent by artificial inputs of water (Table 1). The most common change to the water regime of open water wetlands was using them to store water for irrigation, stock or domestic purposes (Control Categories 2a, 3a and 4a) (Tables 1 and 2). Forty percent of the total area of open water wetlands has been altered in this way. Irrigation tailwater was stored in 6%, by area, of open water wetlands (Categories 2b and 3b), while 17% of their area has been drained, blocked off from the river or created artificially (Categories 3c, 4b).

A relatively small percentage (1%) of river red gum in the study area has been hydrologically controlled (medium or heavy) (Table 3). The river red gum affected in this way was usually adjacent to highly controlled, open water wetlands. Most of the controlled river red gum wetlands were used to store water for irrigation or other purposes.

The mean ± s.d. size of the open water wetlands was 24 ha ± 43 (n = 84) (Appendix). Wetlands < 10 ha in size comprised 12% of the total area of open water wetlands, and wetlands < 100 ha comprised 58% (Appendix). However, 61% of the individual open water wetlands were < 10 ha, and 83% were < 100 ha (Appendix). The mean ± s.d. size of the clumps of dead river red gum was 41 ha ± 41 (n = 14) (Appendix). The open water wetlands with slight, or no, hydrological control tended to be smaller than the medium or heavily controlled wetlands (ANOVA, $F = 3.2$, $df = 1,82$, $P = 0.077$).

Most of the open water and river red gum wetlands in the study area (74% of individual open water wetlands, 79% of their total area; 73% of river red gum) were on freehold land (Tables 2 and 4). A greater proportion of wetlands on Crown land has been affected by local hydrological control compared with wetlands on freehold land (Tables 2 and 4). Forty one percent (67% of the area) of open water wetlands on Crown land were subject to medium or heavy degrees of hydrological control, compared with 34% (48% of the area) of

Table 2 Area in hectares (number) of open water wetlands according to the degree of hydrological control and land tenure, on the floodplain (1974 flood height) of the Murrumbidgee River between Hampden Bridge in Wagga Wagga and Hay Weir.

Control Category		Crown	Freehold	Total
None	1	61(10)	701(31)	762(41)
Slight	2a	67(1)	65(6)	132(7)
	2b	13(2)	48(4)	61(6)
Medium	3a	59(2)	373(11)	432(13)
	3b	16(1)	34(4)	50(5)
	3c	0(0)	80(1)	80(1)
Heavy	4a	209(5)	24(3)	233(8)
	4b	3(1)	252(2)	255(3)
Total controlled		367(12)	876(31)	1243(43)
Total		428(22)	1577(62)	2005(84)

open water wetlands on freehold land (Table 2). The hydrology of 3% of river red gum on Crown land has been locally controlled, compared with 1% on freehold land (Table 4).

DISCUSSION

This survey has shown that the wetlands of the middle section of the Murrumbidgee River have been moderately affected by local manipulations of their water regimes. Such manipulations can be direct, as in off-river storages, or a consequence of irrigation, as in tailwater drainage. Open water wetlands have been been subject to greater hydrological alteration than river red gum wetlands. The survey did not deal with direct impacts of river regulation on wetlands, hydrological control of black box (*E. largiflorens*) wetlands or changes to wetlands off the floodplain.

Flows in the Murrumbidgee River, especially in spring, have been reduced considerably by storing water upstream for later irrigation. The annual mean current flow in the Murrumbidgee is 46% of the mean natural flow (Thomson 1992). The hydrology of a number of black box wetlands has been altered substantially (Roberts and Brickhill 1992, Lawler unpublished data). They are often used to store drainage water from irrigation. In addition, areas of wetland on the Murrumbidgee River downstream of our study area have been affected by local hydrological control (Maher 1990, Department of Water Resources 1991).

Other researchers have not specifically classified wetlands by their degree of hydrological control. Therefore, we cannot directly compare the extent of hydrological change to wetlands in the Murrumbidgee study area with the extent of change to wetlands of other Murray-Darling rivers. However, some of our categories broadly correspond to hydrological categories

Table 3 Area in hectares of river red gum wetlands according to the degree of hydrological control and permanency of surface water, on the floodplain (1974 flood height) of the Murrumbidgee River between Hampden Bridge in Wagga Wagga and Hay Weir.

Control Category		Permanent	Intermittent	Total
None[A]	1	0	44505	44505
Slight[B]	2a	0	0	0
	2b	0	0	0
Medium[B]	3a	39	76	115
	3b	20	0	20
	3c	0	0	0
Heavy[B]	4a	435	0	435
	4b	0	0	0
Total controlled[B]		494	76	570
Total		494	44581	45075

[A] No control areas correspond to areas of live river red gum

[B] Slight to heavy control categories correspond to areas of dead river red gum developed by Pressey (1986) and by Margules and Partners Pty Ltd *et al.* (1990) for Murray River wetlands (Table 5). Open water wetlands in the Murrumbidgee study area appear to be less affected by permanent drowning behind weir pools (Pressey's (1986) category 1) and by inputs of irrigation tailwater (Pressey's (1986) category 4), than open water wetlands of the Murray River. Similar proportions of red gums have been killed by drowning on the floodplains of both rivers.

The hydrology of 28% (28/100) of the wetlands surveyed by Green and Dunkerley (1992) on the Namoi River in northern New South Wales has been controlled by banks, weirs or similar structures. This type of hydrological change corresponds to our categories 2a, 3a and 4a. The equivalent figure in our study area of 32% (28/84) of wetlands is similar to that for the Namoi. Thus, water regimes in wetlands of the middle section of the Murrumbidgee River appear to be less affected by local control than wetlands of the Murray River, but they are affected to a similar extent to the Namoi wetlands. Extending these comparisons will require hydrological surveys of wetlands elsewhere in New South Wales, and Australia. Determining and recording the type and degree of local hydrological change should be an essential part of all wetland surveys.

The impacts of these local hydrological changes to wetlands on waterbirds are currently being investigated. Permanent or prolonged inundation makes wetlands less attractive to some waterbirds, particularly waterfowl (Anatidae), and decreases the abundance of aquatic invertebrates (Briggs *et al.* unpublished data, also see Broome and Jarman 1983). However, wetlands altered in this way can be attractive to other waterbirds, notably cormorant, particularly if trees standing in, or over, permanent or semi-permanent water are available as roosting sites (Briggs *et al.* in press, also see Broome and Jarman 1983).

The major breeding colonies of great

Table 4 Area in hectares of river red gum according to the degree of hydrological control and land tenure, on the floodplain (1974 flood height) of the Murrumbidgee River between Hampden Bridge in Wagga Wagga and Hay Weir.

Control Category		Crown	Freehold	Total
None[A]	1	11769	32736	44505
Slight[B]	2a	0	0	0
	2b	0	0	0
Medium[B]	3a	25	90	115
	3b	4	16	20
	3c	0	0	0
Heavy[B]	4a	349	86	435
	4b	0	0	0
Total controlled[B]		378	192	570
Total		12147	32928	45075

[A] No control areas correspond to areas of live river red gum

[B] Slight to heavy control categories correspond to areas of dead river red gum

Table 5 Comparison of results from this study with those from Pressey (1986) [A] and Margules and Partners Pty Ltd et al. (1990) [B]. The categories of hydrological control are defined in the text.

	Areas (ha)		
	Murrumbidgee	Murray[A]	Murray[B]
Study area	174,700	8,908,000	8,908,000
Wetland area			
Open water	2,005	104,029	321,594
Red gum	45,075	-	232,100
Control category[C]			
Open water 2b + 3b	111 (6%)	11,600 (11%)	-
4a	233 (12%)	36,834 (35%)	-
Red gum 3a + 3b + 4a	570 (1%)	-	2,486 (1%)

[A, B] The study area includes the tributaries of the Murray River, but excludes Sections 9 and 10 (below Lake Alexandrina) in Pressey (1986).

[C] Our control categories 2b + 3b correspond to Pressey's (1986) hydrological category 4, our 4a corresponds to Pressey's 1, and our 3a + 3b + 4a correspond to the condition classes Margules and Partners Pty Ltd et al. (1990) of drowning plus drowned.

cormorant (*Phalacrocorax carbo*), which are known in New South Wales, are on artificially inundated wetlands including Tombullen storage in the study area (Marchant and Higgins 1990, Briggs *et al.* unpublished data). The establishment of the large breeding colony of great cormorants (> 1000 nests) at Tombullen occurred after the wetland was permanently inundated as an off-river storage (J. Wilkinson pers.comm.). Use by nesting waterbirds of such wetlands will last only as long as the dead trees. When these trees decay and fall over, this function of permanently inundated wetlands will be lost.

Wetlands that have been permanently flooded by artificial means also provide habitat for waterbirds during dry periods. The percentage of the surveyed population of waterbirds in eastern Australia on artificial impoundments (Kingsford *et al.* 1992, references therein) is higher in years when fewer wetlands are flooded, and vice versa (Briggs and Lawler 1991).

The impacts of irrigation on wetlands are evident on the Murrumbidgee River and most other major rivers in New South Wales (Briggs 1990). We cannot turn the clock back. However, the water regimes of wetlands should not be altered without sound reason, and government funds should not be used to fund or subsidise such alterations (see Young 1992).

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Appendix Complete list of all open water (OW) and dead river red gum (DG) wetlands in the study region. Maps are Wagga Wagga (WW)), Collingullie (COL), Coolamon (COO) Berembed Weir (BW), Bogolong Hills (BH), Gogeldrie Weir (GW), Darlington Point (DP), Benerembah (BEN), Carrathool (CAR), and Hay (HAY) in the 1:25,000 and 1:50,000 series produced by the Central Mapping Authority of N.S.W. Wetlands of live river red gum were continuous in the study region and are not listed separately. They covered 44,581 ha. P, permanently flooded; I, intermittently flooded; F, freehold land; C, Crown land. Categories of hydrological control are described in the text.

Map	Grid reference	Name	Wetland type	Surface water	Tenure	Area(ha)	Control category
WW	312167	Gobbagombalin Lagoon	OW	P	F	4	3a
WW	310143	Flowerdale Lagoon	OW	P	F	8	3b
COL	225145	West Pomingalarna	OW	I	F	11	2a
COL	203178	Kelvin Grove - Eastern end	OW	P	F	2	3a
COL	198177	Kelvin Grove - Western end	OW	I	F	7	1
COL	180190	Island Lagoon	OW	P	F	24	2a
COL	153186	Dunura	OW	I	F	3	1
COL	132216	Bellevue	OW	I	F	4	1
COL	128220	Bellevue	OW	I	C	1	1
COL	104225	Mundowey Lagoon	OW	I	F	6	2a
COL	093243	Currawananna Lagoon	OW	I	F	13	2a
COL	070250	Currawarna township 1	OW	I	F	8	1
COL	068247	Currawarna township 2	OW	I	F	3	1
COL	040253	Ganmain Station	OW	I	F	4	1
COO	015283	Sans Souci homestead	OW	P	F	1	3b
COL	001251	Sans Souci	OW	I	F	3	2b
COL	001245	Berryjerry	OW	I	F	2	1
BW	968289	Bulgari Lagoon	OW	I	F	8	1
BW	947296	Bulls Run 1	OW	I	F	9	1
BW	930384	Bulls Run Swamp	OW	I	F	120	1
BW	913359	Bulls Run 2	OW	I	F	6	1
BW	899372	Deepwater 1	OW	I	F	4	1
BW	897380	Matong Lagoon	OW	P	F	10	4a
BW	896413	Deepwater Lake	OW	I	F	80	3c
BW	883343	Wagingoberembee Depression	OW	I	F	55	1
BW	869372	Deepwater 2	OW	P	F	8	4a
BW	862361	Wauberrima	OW	P	F	6	3a

Appendix (continued)

Map	Grid reference	Name	Wetland type	Surface water	Tenure	Area(ha)	Control category
BW	842420	Berembed	OW	I	F	24	1
BW	821469	Uarah Fish Hatchery	OW	P	F	22	4b
BW	773477	Green Valley 1	OW	I	F	4	1
BW	772470	Green Valley 2	OW	I	F	2	1
BH	744560	Grong Grong Swamp	OW	I	F	98	1
BW	697516	Middle and Oak Cks	DG	P	F	28	4a
BH	696547	Cudgello Swamp	OW	I	F	95	3a
BW	695528	Bund. Ck & Grass Innis Swamp	DG	P	F	58	4a
BW	678465	Buckinbong Depression	OW	I	F	176	3a
BW	676533	Grass Innis Swamp	OW	P	F	6	4a
BW	670530	Bund. Ck & Grass Innis Swamp	DG	P	C	25	4a
BW	665527	Bundidgerry Creek	OW	P	C	15	4a
BW	660460	Below Dixons Dam	OW	I	F	66	3a
BW	657377	Sandy Creek	DG	P	F	6	3a
BW	656430	Dixons Dam	DG	P	F	76	3a
BW	656430	Dixons Dam	OW	I	F	7	3a
BW	618541	Lake Talbot	DG	P	C	36	4a
BW	612543	Lake Talbot	OW	P	C	19	4a
BW	603533	Narrandera State Reserve	OW	I	C	2	1
BW	584541	Narrandera Sewage Works	OW	P	C	3	4b
BW	569497	Poisoned Water Holes Ck	OW	I	F	16	1
BH	560556	Narrandera State Forest	OW	I	C	4	1
GW	516551	Goonerah Lagoon	OW	I	F	8	2a
GW	505594	MIA I Forest	OW	I	C	6	1
GW	502547	Goonerah Swamp	OW	I	F	69	1
GW	500559	Gillenbah	OW	I	F	8	1
GW	426700	MIA II Forest	DG	P	C	4	3b
GW	415546	Euroliabah	OW	I	F	2	1
GW	412579	Gum Hole	OW	I	F	3	2a
GW	375590	Dry Lake	OW	I	F	172	1
GW	337691	Coonancoocabil swamps	DG	P	C	47	4a
GW	337691	Coonancoocabil Lagoon and swamps	OW	P	C	25	4a

GW	323700	Coonancoocabil Lagoon	DG	P	C	19	4a
GW	315686	Gogeldrie	OW	I	F	6	3a
GW	257698	Euwarderry Lagoon	OW	P	C	16	3b
GW	225657	Tombullen Storage	DG	P	C	158	4a
GW	222650	Tombullen Storage	OW	P	C	147	4a
GW	203700	Kenlock	DG	P	F	16	3b
GW	203700	Kenlock	OW	P	F	19	3b
GW	164728	Gooragool Lagoon	DG	P	C	25	3a
GW	164728	Gooragool Lagoon	OW	P	C	55	3a
GW	146717	Mantangry Lagoon	DG	P	F	8	3a
GW	146717	Mantangry Lagoon	OW	P	F	6	3a
GW	101743	Darlington Lagoon	OW	I	C	11	2b
GW	101695	Sunshower	OW	I	F	12	2b
DP	037741	Darlington Point	OW	I	F	11	1
DP	029715	Uri East 1	OW	I	F	10	1
DP	976729	Uri East 2	OW	I	F	8	1
DP	935768	Wowong Lagoon	OW	I	F	12	1
DP	935768	Wowong Lagoon	OW	I	C	10	1
DP	919726	Yarradda Lagoon	OW	P	C	66	2a
DP	896765	Benerembah State Forest	OW	I	C	12	1
DP	892740	Yarradda State Forest 1	OW	I	C	9	1
DP	880750	Yarradda State Forest 2	OW	I	C	4	1
DP	880750	Yarradda State Forest 2	OW	I	F	8	1
DP	839767	The Homestead	OW	I	F	2	1
BEN	697872	Riverdale	OW	I	F	7	1
BEN	665881	Groongal	OW	P	F	5	3b
BEN	662865	Packidilli Lagoon	OW	I	C	2	2b
BEN	662865	Packidilli Lagoon	OW	I	F	2	2b
BEN	652866	Weedyabregan Lagoon	OW	I	F	8	1
BEN	645883	Webbs Lagoon eastern end	OW	P	F	3	3a
BEN	643888	Webbs Lagoon western end	OW	P	F	3	3a
BEN	638886	Webbs Lagoon western end	OW	P	C	4	3a
BEN	630890	McKennas Lagoon	OW	I	F	31	2b
CAR	603887	Dinnys Lagoon	OW	I	F	9	1
CAR	467835	Cooey Point Lagoon	OW	I	C	11	1
CAR	394832	Toms Point	OW	I	C	3	1
HAY	922789	Hay Weir	DG	P	C	64	4a