Gwydir region

Gwydir Wetlands

The Gwydir Wetlands lie in the downstream reaches of the Gwydir River, below Moree in northern New South Wales (Figure B5.1).

The Murray–Darling Basin Authority (MDBA) used the Wetlands Global Information Systems of the Murray–Darling Basin series 2.0 dataset (Kingsford, Thomas & Knowles 1999) as well as data from *A directory of important wetlands in Australia* (Department of the Environment, Water, Heritage and the Arts 2001) to determine boundaries of the Gwydir Wetlands hydrologic indicator site. This includes Gwydir River, the Gingham watercourses, the confluence of the Gwydir and Gingham rivers, and the wetlands along Mallowa Creek. Spatial data used in this map is listed in Table B1.3.

Downstream of Moree, the channels and streams of the Gwydir River form the Gwydir Wetlands, which include the Gingham and lower Gwydir watercourses, the Mehi River, Mallowa and Moomin creeks and the extensive floodplains associated with these watercourses (Figure B5.1). The Gwydir Wetlands are a mosaic of wetland types, ranging from semipermanent marshes and waterholes to floodplain woodlands only inundated by large floods (Australian Nature Conservation Agency 1996; Torrible, Wettin & Roberts 2010). Although highly modified by agricultural development and water management, these wetlands retain high ecological and cultural values (NSW Department of Environment, Climate Change and Water 2010e).

The core wetland areas are semipermanent, with vegetation typified by marsh club rush (*Bolboschoenus fluviatilis*) and water couch (*Paspalum distichum*). These areas are inundated frequently by overbank flooding from many small channels (McCosker & Duggin 1993). River cooba (*Acacia stenophylla*) and lignum (*Muehlenbeckia florulenta*) shrublands are common in and around the margins of the core wetlands. Coolibah (*Eucalyptus coolabah)* woodlands are an important feature of the floodplain, fringing the semipermanent wetland areas and forming extensive woodlands on less frequently flooded parts of the floodplain (Keyte 1994; Bowen & Simpson 2009a).

Table B5.1 Ramsar-listed lands: Gwydir Wetlands

Wetland	Location	Location	Area (ha)
Old Dromana	Lower Gwydir channel	Lat: 29º21'00" Long: 149º19'50"	600
Goddards Lease	Gingham watercourse	Lat: 29º25'00" Long: 149º23'10"	20
Crinolyn	Gingham watercourse	Lat: 29º13'20" Long: 149º07'20"	84
Windella[a]	Gingham watercourse	Lat: 29º12'10" Long: 149º05'40"	119

a Windella is subject to a remediation order under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth) after being illegally cleared (NSW Department of Environment and Climate Change 2009a).

The Gwydir Wetlands are known to be a major site for waterbird breeding in Australia (Morse 1922; McCosker 1996b), and they also provide habitat for hundreds of species of animals and plants. The Gwydir Wetlands are part of the traditional country of the Gamilaroi people, and were an important location for traditional Aboriginal settlement (NSW Department of Environment, Climate Change and Water 2010e).

Within the central and northern sections of the wetlands, water is delivered through the lower Gwydir and Gingham watercourses respectively. In the southern sections of the wetlands, water is delivered though a series of creeks that break out from the Mehi River (Mallowa and Moomin creeks). Flows to the system are delivered through the Gwydir River channel.

The Gwydir's headwaters are impounded by Copeton Dam, which was built in the late 1970s. This dam has a capacity of 1,364 GL; however, the dam controls only about 55% of Gwydir system inflows (Keyte 1994) because a number of unregulated tributaries flow into the Gwydir River below it. Historically, the Gwydir Wetlands covered an area of around 220,000 ha (Green & Bennet 1991); however, irrigated agriculture and broadacre cropping has reduced the area of the wetlands by 85% (Bowen & Simpson 2009a), with remnant wetlands now remaining as fragmented patches within a cultivated landscape.

Four parcels of land within the Gwydir Wetlands are listed under the Ramsar Convention on Wetlands (Table B5.1). These areas are a small (823 ha) but representative example of the environmental values of the broader Gwydir Wetlands.

Values

The Gwydir Wetlands have been identified as a hydrologic indicator site in the Murray–Darling Basin by meeting all five of the MDBA's key environmental asset criteria (Table B5.2).

Table B5.2 MDBA key environmental asset criteria: Gwydir Wetlands

Criterion	Explanation
1. Formally recognised in, and/or is capable of supporting species listed in relevant international agreements	The Gwydir Wetlands are formally recognised in, or are capable of supporting species listed in the Japan–Australia, China–Australia, or the Republic of Korea–Australia migratory bird agreements. They also contain four Ramsar sites (see Table B5.1). For a full list of species listed under Commonwealth legislation that have been recorded at Gwydir refer to Table B5.10.
2. Natural or near-natural, rare or unique	The Gwydir Wetlands support the largest stand of marsh club rush sedgeland in New South Wales (Green & Bennett 1991). In 1974 the marsh club rush community was reported to cover 2,200 ha.
3. Provides vital habitat	Three vegetation groups are important in supporting the breeding and feeding requirements of animals that visit the wetlands. These groups are: semipermanent — water couch grasslands, water couch – spike rush *(Eleocharis obicis)* meadows and marsh club rush swamps inner floodplain vegetation — typified by river cooba and lignum shrublands, which surround the semipermanent wetlands; coolibah and/or river red gum *(Eucalyptus camaldulensis)* forests are also found along watercourses in the eastern sections of the wetlands outer floodplain vegetation — the coolibah and black box *(Eucalyptus largiflorens)* woodlands that extend from the inner floodplains across an area that experiences a wide range of inundation frequency and duration.
4. Supports Commonwealth-, state- or territory-listed threatened species and/or ecological communities	The Gwydir Wetlands meets this criterion because it supports species listed as threatened under commonwealth or state legislation. For a full list of species that have been recorded refer to Table B5.10.
5. Supports, or is capable of supporting, significant biodiversity	The Gwydir Wetlands are renowned for large-scale waterbird breeding, with tens of thousands of birds breeding throughout the system. Of the waterbirds that breed in the wetlands, colonial nesting species are prominent. Species that breed in the largest numbers include the eastern great egret *(Ardea alba)*, intermediate egret *(A. intermedia)*, little egret *(Egretta garzetta)*, nankeen night heron *(Nycticorax caledonicus)*, glossy ibis *(Plegadis falcinellus)*, Australian white ibis *(Threskiornis molucca)*, straw-necked ibis (*T.spinicollis*), little pied cormorant *(Phalacrocorax melanoleucos)* and little black cormorant *(P. sulcirostris) (CSIRO 2007a).*

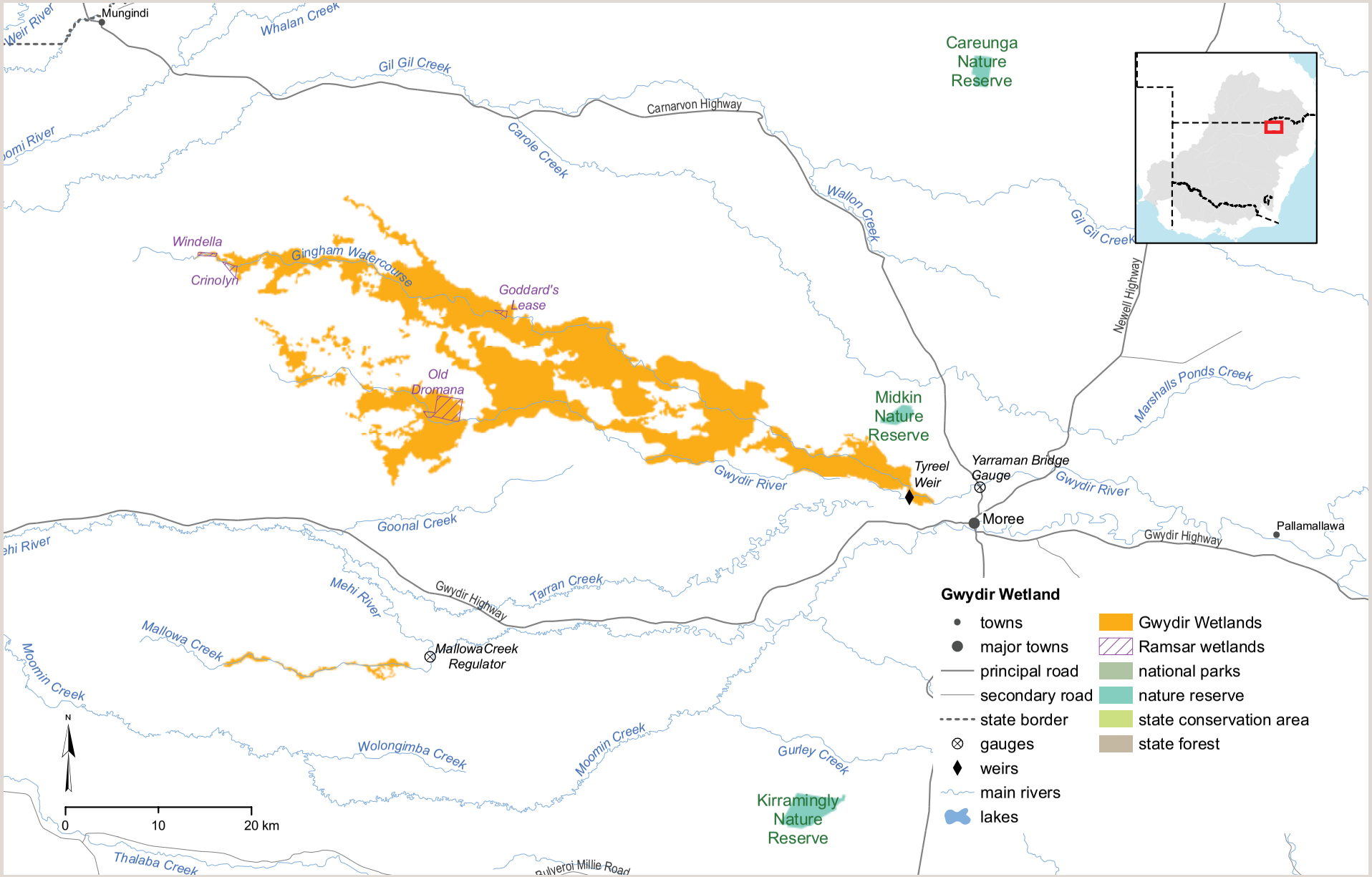

Figure B5.1 Location and extent of the hydrologic indicator site: Gwydir Wetlands

Hydrology

Water resource development has resulted in a greater than 75% increase in the average period between flood events that inundate 20,000 ha (about 20%) of the Gwydir Wetlands (CSIRO 2007a). The maximum period between flood events has increased by 64%, or from 7 to 11.5 years, while the average annual above-threshold flood volume has been reduced by 42%. However, on average, individual flood events are now 8% larger in terms of flooding volume because of the reduction in flood frequency. These changes are consistent with the stressed ecological condition of the wetlands (CSIRO 2007a).

The Gwydir Wetlands are divided into the Lower Gwydir and Gingham channel management unit and the Mallowa watercourse management unit.

The Lower Gwydir and Gingham channel management unit includes the central and northern areas of the Gwydir Wetlands. All four Ramsar-listed sites lie within this unit. The Gwydir River splits 7 km west of Moree at Tyreel Weir, upstream of what is called the Gwydir raft. The resultant two channels, the Gingham channel and the Lower Gwydir channel, then carry water to the wetlands downstream. This management unit contains the best remnants of the Gwydir Wetlands, with areas of semipermanent water couch, spike rush and club rush communities and surrounding lignum and river cooba communities. The reduced water regime this management unit has experienced since regulation began means that many areas that previously contained wetland vegetation have been cleared and turned into improved dryland pastures or crops, significantly reducing the size of the wetlands.

The Mallowa watercourse management unit comprises Mallowa Creek, an effluent channel of the Mehi River that runs through the southern extent of the Gwydir Valley. Historically, Mallowa Creek's floodplains supported coolibah woodland, floodplain wetlands dominated by river cooba and lignum, and wet meadows of spike rush and water couch (Bowen & Simpson 2009a). However, flows through Mallowa Creek have been severely reduced and are heavily regulated, which has affected the health and extent of floodplain vegetation communities (Bowen & Simpson 2009a). For example, a 6 GL stock and domestic flow is released down the channel from February to May and is directed through 13 structures and into 52 weirs. During this flow, some 800 ha of floodplain is inundated through breaks in the creek bank (Wyllie 2009).

Changes to the hydrology as well as the clearing of both semipermanent and floodplain wetland communities have resulted in substantial reductions in the area of the Gwydir Wetlands. The study undertaken by Bowen and Simpson (2009a) showed significant decline of various wetland species in both semipermanent and floodplain wetland areas within the Gingham and lower Gwydir watercourses (Tables B5.3 and B5.4). The study also showed the appearance of other wetland species in later years (e.g. cumbungi and common reed).

Table B5.3 Area of semipermanent wetlands, 1995–2008: Lower Gwydir and Gingham channel management unit

Location	Wetland vegetation	Area (ha)		
		1996	2005	2008
Gingham channel	Water couch – spike rush	9,393	5,298	3,485
	Marsh club rush	–	–	11
	Cumbungi	–	–	257
	Total	9,393	5,298	3,753
Lower Gwydir	Water couch – spike rush	4,254	2,726	2,816
	Marsh club rush	317	132	181
	Common reed–marsh club rush			11
	Cumbungi–marsh club rush			20
	Common reed		36	48
	Total	4,571	2,894	3,076
Total			**8,192**	**6,829**

Source: Bowen & Simpson (2009a)

Table B5.4 Area of floodplain wetland, 1996–2008: Lower Gwydir and Gingham channel management unit

Functional vegetation community	Floodplain vegetation community	Area (ha)		
		1996	2005	2008
Floodplain wetland	River cooba swamp–lignum shrubland	5,527	3,628	3,207
	Coolibah – river red gum forest	3,653	3,543	3,512
	Total	9,180	7,171	6,719
Floodplain vegetation	Coolibah–open woodland	119,108	55,623	51,652
	Coolibah–black box woodland	18,742	19,952	19,578
	Total	137,850	75,575	71,230
Total		**147,030**	**82,746**	**77,949**

Source: Bowen & Simpson (2009a)

Environmental objectives and targets

Environmental objectives have been determined to improve the environment of the Gwydir Wetlands using the key environmental asset criteria.

Targets to achieve these objectives have been specified for flood-dependent vegetation communities considered essential to support wetland processes and to provide crucial habitat for identified flora and fauna species. Flow targets to meet these objectives are presented in Table B5.5. The justification for selecting these targets and the flows suggested to fulfil them is presented in following sections.

Table B5.5 Environmental objectives and targets: Gwydir Wetlands

Objectives	Justification of targets	Target
1. To conserve the Ramsar site consistent with its ecological character, and to protect and restore ecosystems that support migratory birds listed under international agreements (Criterion 1) 2. To protect and restore natural or near-natural, rare or unique water-dependent ecosystems (in their current state) (Criterion 2) 3. To protect and restore water-dependent ecosystems that provide vital habitat (Criterion 3) 4. To protect and restore water-dependent ecosystems that support Commonwealth-, state- or territory-listed threatened species and communities (Criterion 4) 5. To protect and restore water-dependent ecosystems that support, or are capable of supporting, significant biodiversity (Criterion 5).	The Gwydir Wetlands support one of the largest remaining stands of water couch and marsh club rush which support the animals that visit the wetlands (Objectives 1–5).	Maintain 100% of the current extent of semipermanent wetland vegetation in good condition
	The floodplain communities of the Gwydir Wetlands provide critical breeding and rookery habitat for a range of species listed under international agreements (Objectives 1, 3, 4 and 5).	Maintain 30% of the current extent of floodplain vegetation in good condition Maintain 90% of the current extent of floodplain wetland vegetation in good condition
	The floodplain wetlands of the Mallowa watercourse have been considerably reduced in size in recent years. The remaining floodplain wetland provides critical habitat in this section of the Gwydir Wetlands (Objectives 3 and 4).	Maintain 100% of the current extent of floodplain wetlands in good condition (Mallowa watercourse)
	The Gwydir Wetlands are renowned for large-scale waterbird breeding. Colonial nesting species are prominent (Objectives 1 and 4).	Provide conditions conducive to successful breeding of colonial nesting waterbirds
	Several native fish species that breed in the channels of the Gwydir Wetlands are listed as threatened under state legislation (Objective 4).	Stimulate breeding and provide stable post flows to ensure fish spawning success

Table B5.6 Vegetation community wetlands in ecologically functional groups: Lower Gwydir and Gingham channel management unit

Semipermanent wetland	Floodplain wetland vegetation	Floodplain vegetation
Water couch – spike rush Marsh club rush Cumbungi Common reed Common reed – marsh club rush Cumbungi – marsh club rush	River cooba – lignum River red gum Coolibah/river red gum[a]	Coolibah woodlands[a] Coolibah and black box[a] Native grasslands Derived grasslands Myall rosewood (weeping myall woodland) *(Alectryon oleogolius)*[b] Poplar box *(Eucalyptus populnea)* Baradine red gum *(Eucalyptus codonocarpa)* Belah *(Casuarina cristata)*

a Endangered ecological community under the *Threatened Species Conservation Act 1995* (NSW)

b Endangered ecological community under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth)

Source: NSW Department of Environment, Climate Change and Water (2009b)

Table B5.7 Area of functional vegetation groups and the percentage area inundated under varied inflow magnitudes: Lower Gwydir and Gingham channel management unit

	Percentage of functional group inundated		
Total inflow (GL)	Semipermanent wetland (6,828 ha)	Floodplain wetland (6,416 ha)	Floodplain vegetation (74,373 ha)
25	47 (3,209 ha)	23 (1,475 ha)	2 (1,487 ha)
45	72 (4,916 ha)	36 (2,309 ha)	3 (2,231 ha)
60	84 (5,735 ha)	46 (2,951 ha)	5 (3,718 ha)
80	90 (6,145 ha)	54 (3,464 ha)	8 (5,949 ha)
150	97 (6,623 ha)	71 (4,555 ha)	17 (12,643 ha)
250	98 (6,691 ha)	83 (5,325 ha)	30 (22,311 ha)

Note: Vegetation communities grouped into ecologically functional groups

Targets for the Lower Gwydir and Gingham channel management unit

The targets set for the Lower Gwydir and Gingham channel management unit revolve around providing conditions favourable for fish- and bird-breeding and maintaining wetland and floodplain vegetation.

The fish target is aimed at triggering fish-breeding events within the Gwydir and Gingham channels and maintaining flows to support the juvenile fish as they grow. Fish in this reach require a small summer flood event as stimulus to breed and then relatively low stable flows to ensure the juveniles survive until they obtain a more robust body size (G Wilson 2009, pers. comm., 25 November).

As the Gwydir Wetlands are considered to be an important breeding site for a range of waterbirds, a target specifying conditions suitable for the successful large-scale breeding of colonial nesting waterbirds was suggested.

Other targets proposed for the Lower Gwydir and Gingham channel management unit aim to maintain the current extent of wetland and flood-dependent floodplain vegetation communities in good condition. Currently, the extent of vegetation communities within the Gwydir Wetlands represents less than 15% of the historical extent of the wetlands (Bowen & Simpson 2009a). Given this, it was considered paramount to the longevity of the wetlands that these extents at least should be protected and restored to good condition.

The percentage of vegetation communities inundated was determined through modelling undertaken by the NSW Department of Environment, Climate Change and Water (2010f), by deriving a spatially explicit relationship between hydrologic inputs and inundation extent for a range of flood magnitudes (Thomas et al. in prep. a). The inundated area for a specified range of river flow magnitudes was then derived and matched to each functional vegetation community (see Table B5.6; Bowen & Simpson 2009a). From this, the proportion of inundation extent was reported for each specified inflow volume (see Table B5.7), based on the probability of inundation distribution (Thomas et al. in prep. b, in prep. c).

The individual vegetation targets set for the Lower Gwydir and Gingham channel management unit cannot be met by single flow rules. The various flow rules suggested constitute a flow regime that would provide flooding at the desired frequency and duration to sustain the various vegetation communities of the wetlands; therefore, every part of this flow regime is important if targets are to be met.

The target percentage of each functional vegetation group was derived from information provided by the NSW Department of Environment, Climate Change and Water (2010f) (see Table B5.7). While the floodplain vegetation target aims to protect only 30% of this functional group, most of this is assumed to be flood-dependent vegetation (coolibah and black box woodlands) rather than flood-tolerant communities, which were also mapped in this group (Table B5.6). In addition, the frequency of large magnitude flows needed to inundate these communities (250 GL flow events) has been relatively unaffected by water resource development (see Table B5.8).

Targets for Mallowa watercourse management unit

The target suggested for the Mallowa watercourse management unit is aimed at providing flooding to the remaining lignum, coolibah and river red gum communities. These predominantly exist along the braided channels of Mallowa Creek (Bowen & Simpson 2009a). The flow event specified to meet the target for this unit is a small magnitude flow (120 ML/d) over an extended period (90 days). Specification of a higher magnitude flow would result in significant losses before the water reached wetlands, because of the extensive infrastructure upstream on Mallowa Creek (Albertson 2009, pers. comm., 18 November).

Environmental water requirements

The parameters used to describe the flow volumes presented for the Lower Gwydir and Gingham channel management unit in Table B5.8 were derived from interpretation of the modelled without-development flow regime. The interpretation included analysing the without-development flow hydrograph and calculating the volume of flow events with a range of thresholds and durations (Table B5.9).

The natural hydrograph of the lower Gwydir River is characterised by high-volume, short-duration flood events separating periods of low flows (Figure B5.2). Large proportions of the flow volume also occur in the rising and falling limbs of the event hydrographs. This provided challenges in defining appropriate flow thresholds and durations for modelling purposes. Therefore, relatively short two-day flow durations were selected to represent the targeted flow volumes. These parameters defined the heart of the flow event, with a large proportion of the flow volume of an individual event occurring in the rising and falling limbs of that event (Figure B5.3). While variation exists in the volumes described by the selected parameters, this method provided a practical means of defining events likely to deliver the volumes required.

Table B5.8 Flow volumes provided by specific flow parameters, measured at Yarraman Bridge gauge on the Gwydir River: Gwydir Wetlands

Parameters	Target volume (GL)[a]	Mean volume (GL)	Median volume (GL)	Maximum volume (GL)	Minimum volume (GL)
3,000 ML/d for 2 days	25	25	23.5	94	8
5,000 ML/d for 2 days	45	46	44.5	97	19
10,000 ML/d for 2 days	60	78	78.5	30	183
25,000 ML/d for 2 days	150	153	160	219	74
30,000 ML/d for 2 days	250	245	250	522	127

a Target volumes are those stipulated in Table B5.7

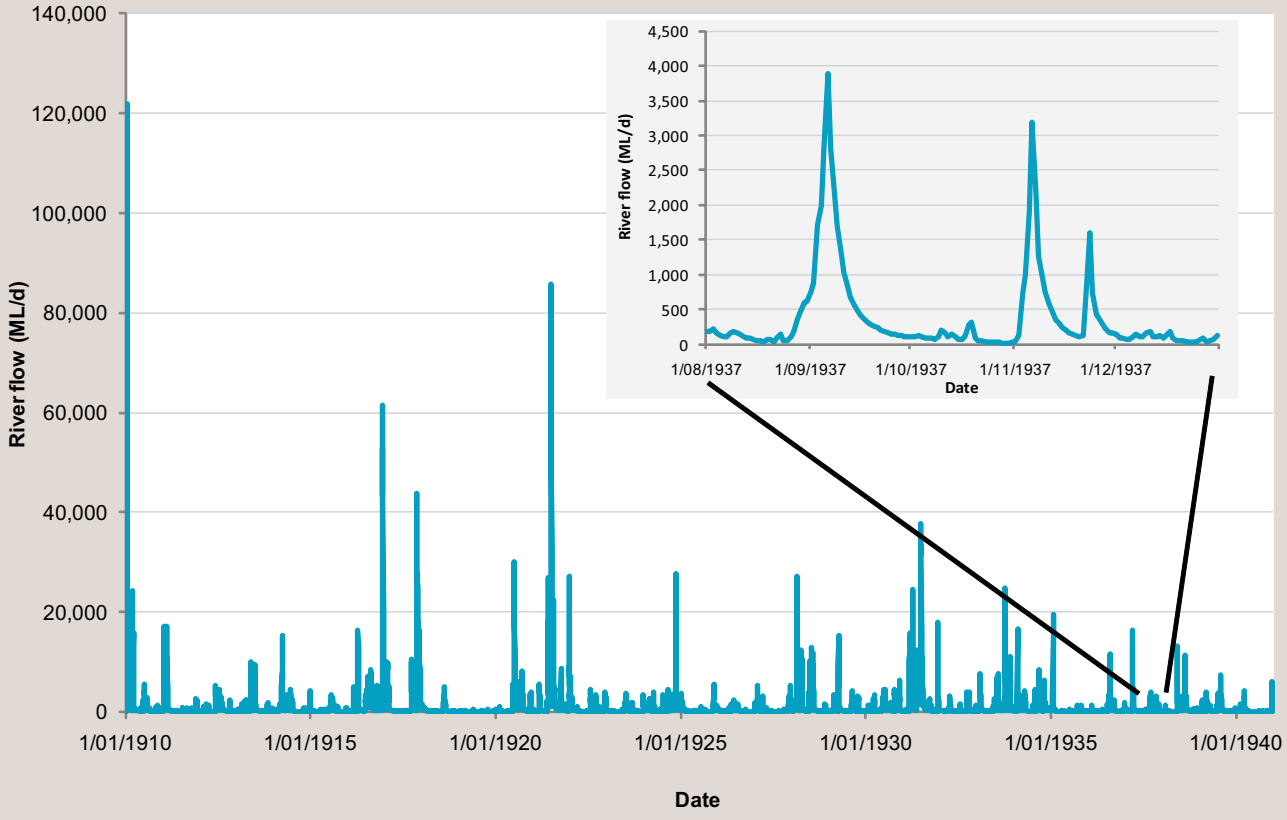

Figure B5.2 Modelled without-development flow hydrograph, measured at Yarraman Bridge gauge: Gwydir River

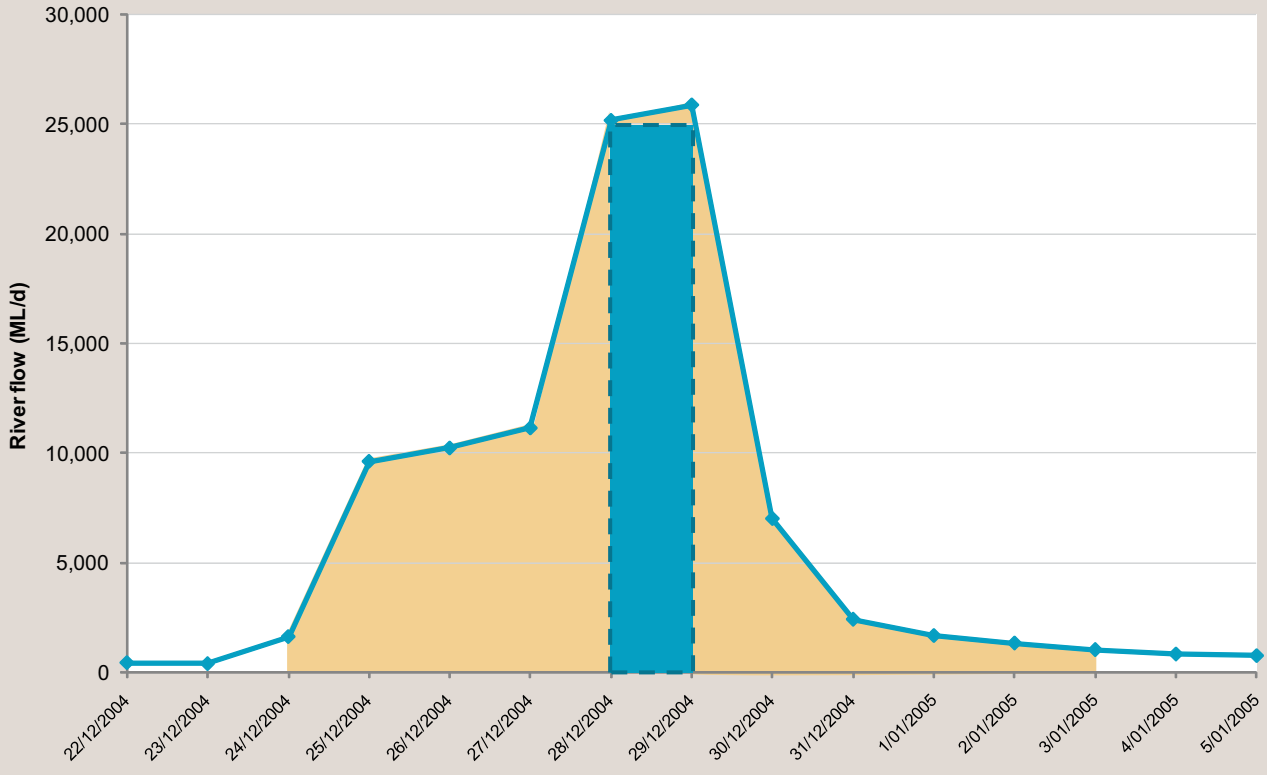

Figure B5.3. Characterisation of a flow event at Yarraman Bridge gauge: Gwydir River

Note: Total flow volume from 24 December 2004 to 3 January 2005 is 96,000 ML. The blue central area represents the parameters (25,000 ML/d for 2 days) used to describe the event. Red area denotes the rising and falling limbs of the flow event.

Table B5.9 summarises the flow parameters suggested to fulfil the targets set for the Gwydir Wetlands. A range of proportions are reported for each flow threshold and duration, including the modelled without-development and current arrangements frequencies, and the low and high uncertainty proportions suggested to sustain the Gwydir Wetlands.

For several of the flow events suggested (e.g. 150 ML/d for 45 days and 1,000 ML/d for two days), the frequencies from the current arrangements scenario are higher than the frequencies predicted to occur without development (Table B5.9). This is most likely a response to water resource development, which has been shown to increase base flows in many catchments within the Murray–Darling Basin (Sheldon et al. 2000). As noted earlier, the flow for Mallowa watercourse management unit never occurred naturally. All other suggested flows occurred with a higher frequency without development than under current conditions.

Table B5.9 Environmental water requirements: Gwydir Wetlands

Target	Event				Proportion of years event required to achieve target		Proportion of years event occurred under modelled without-development conditions	Proportion of years event occurs under modelled current arrangements
	Flow rule	Flow required (ML/d)	Duration	Timing Low uncertainty				
Lower Gwydir and Gingham channel management unit (Gwydir River at the Yarraman Bridge gauge)								
Stimulate breeding and provide stable post flows ensure fish spawning success	1	150	45 days	December to February	66%	50%	30%	92%
	2	1,000	2 days	December to January	66%	50%	70%	76%
Maintain 100% of the current extent of semipermanent wetland vegetation in good condition	3	5,000	2 days	August to March	66%	60%	80%	64%
Maintain 90% of the current extent of floodplain wetland vegetation in good condition	4	3,000	2 days	January to December	80%	60%	88%	83%
Maintain 30% of the current extent of floodplain vegetation in good condition	5	10,000	2 days		50%	40%	52%	46%
Provide conditions conducive to successful breeding of colonial nesting waterbirds	6	25,000	2 days		25%	20%	25%	24%
	7	30,000	2 days		20%	20%	20%	23%
Mallowa management unit (Mallowa Creek regulator gauge)								
Maintain 100% of the current extent of floodplain wetlands in good condition (Mallowa watercourse)[a]	8	120	90 days	January to December	50%	50%	0%[a]	0%[a]

a While an event of this duration did not occur naturally, this flow rule is suggested to ensure filling of the wetlands with minimal transmission losses along Mallowa Creek

Risks

Weed control

The exotic weeds lippia (*Phyla canescens*) and water hyacinth (*Eichhornia crassipes)* are an increasing threat to the integrity of the vegetation communities within the Gwydir Wetlands (NSW Department of Environment and Conservation 2006a). Lippia occurs throughout the wetlands, but water hyacinth is presently confined to the Gingham watercourse. Several management strategies are in place to contain these weeds, revolving around flow manipulation. In terms of lippia control, any flows to the wetlands need to be delivered over summer between late October to March (Wilson et al. 2009b), and the resultant flooding should keep water in the wetlands for longer than three months (McCosker 1994). Flows delivered earlier in the season, which cause only short-term flooding, will give lippia a competitive advantage over native wetland species (Wilson et al. 2009b). For the management of water hyacinth, small flows may be an option to stimulate growth without stimulating broadscale hyacinth growth. Once these flows recede, the plants become desiccated.

Mallowa watercourse water delivery

It is recognised that the considerable level of irrigation development in the Mallowa system limits the potential of regulating larger flows down the channel to inundate the wetland vegetation, because when flow rates exceed around 50 ML/d, much of this water is harvested by irrigators for off-river storage and use. If higher flows were considered, considerable losses would occur or on-ground infrastructure changes would need to be undertaken.

Use of Yarraman Bridge gauging station

The nearest gauge upstream of the Gwydir Wetlands that can be used in flow modelling is the one at Yarraman Bridge; this gauge was used in the development of the proposed Basin Plan.

However, the long distance between this gauge and the wetlands (in excess of 55 km of river), coupled with the presence of multiple channels and associated high-flow losses, introduces risks surrounding the representativeness of this gauge for flows entering the wetlands. Because of the influence of the raft below Tyreel Weir, the Gwydir channel splits into the Lower Gwydir channel, the Gingham channel and several smaller anabranching channels, effectively reducing their capacities. For example, the channel capacity at Yarraman Bridge is around 40,000 ML/d, while at the Tyreel regulator, around 8 km downstream, the channel capacity is 3,000 ML/d (Keyte 1994). Importantly, the delivery of several of the larger flow requirements suggested for the Lower Gwydir and Gingham channel management unit will rely on natural flow events and, given existing infrastructure, could not be provided as controlled releases.

Table B5.10 Species relevant to criteria 1 and 4: Gwydir Wetlands

Species	Recognised in international agreement(s)[1]	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth)	*Fisheries Management Act 2004* (NSW)	*Threatened species conservation Act 1995* (NSW)
Birds				
Australian bustard (*Ardeotis australis*)[2, 3]				E
Barking owl (*Ninox connivens*)[3]				V
Barn swallow (*Hirundo rustica*)[4]	✓			
Black tern (*Chlidonias niger*)[4]	✓			
Black-necked stork (*Ephippiorhynchus asiaticus*)[3]				E
Blue-billed duck (*Oxyura australis*)[2, 3]				V
Brolga (*Grus rubicundus*)[2]				V
Brown treecreeper (*Climacteris picumnus*)[2]				V
Bush stone-curlew (*Burhinus grallarius*)[3]				E
Caspian tern (*Hydroprogne caspia*)[4]	✓			
Cattle egret (*Ardeola ibis*)[4]	✓			
Comb-crested jacana (*Irediparra gallinacea*)[5]				V
Common tern (*Sterna hirundo*)[4]	✓			
Diamond firetail (*Stagonopleura guttata*)[2]				V
Eastern great egret (*Ardea modesta*)[4]	✓			
Fork-tailed swift (*Aspus pacificus*)[4]	✓			
Freckled duck (*Stictonetta naevosa*)[2, 3]				V
Glossy black cockatoo (*Calyptorhynchus lathami*)[2, 3]				V
Glossy ibis (*Plegadis falcinellus*)[4]	✓			
Grass owl (*Tyto capensis*)[3, 5]				V
Greenshank (*Tringa nebularia*)[4]	✓			
Grey falcon (*Falco hypoleucos*)[3]				V
Grey-crowned babbler (*Pomatostomus temporalis*)[2, 3]				V
Hooded robin (*Melanodryas cucullata*)[2, 3]				V
Jabiru (black-necked stork) (*Ephippiorhynchus asiaticus*)[5]				V
Latham's snipe (*Gallinago hardwickii*)[4]	✓			
Magpie goose (*Anseranas semipalmata*)[2, 3]				V
Osprey (*Pandion haliaetus*)[5]				V
Painted snipe (*Rostratula benghalensis*)[2, 3]	✓	V		V
Rainbow bee-eater (*Merops ornatus*)[4]	✓			
Sharp-tailed sandpiper (*Calidris acuminata*)[4]	✓			
Square-tailed kite (*Lophoictinia isura*)[3]				V
Turquoise parrot (*Neophema pulchella*)[3, 5]				V
White-throated needletail (*Hirundapus caudacutus*)[4]	✓			
Fish				
Silver perch (*Bidyanus bidyanus*)[2]			V	
Mammals				
Little pied bat (*Chalinolobus picatus*)[3]				V
Yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)[3]				V

... continued

Table B5.10 Species relevant to criteria 1 and 4: Gwydir Wetlands (continued)

Species	Recognised in international agreement(s)[1]	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth)	*Fisheries Management Act 2004* (NSW)	*Threatened species conservation Act 1995* (NSW)
Communities				
Aquatic ecological community of the Gwydir Wetlands[4]			E	
Coolibah – black box woodland of the northern riverine plains in the Darling Riverine Plains and Brigalow Belt South bioregions[6]				E
Myall woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray–Darling Depression, Riverina and NSW South Western Slopes bioregions[5]				E

E = endangered V = vulnerable

1 Japan–Australia Migratory Bird Agreement, China–Australia Migratory Bird Agreement, or Republic of Korea – Australia Migratory Bird Agreement

2 NSW Department of Environment, Climate Change and Water (2009d)

3 NSW Department of Environment, Climate Change and Water (2009e)

4 Taylor-Woods & Jaensch (2006)

5 NSW National Parks and Wildlife Service (1999a)

6 NSW Department of Environment, Climate Change and Water (2009d)