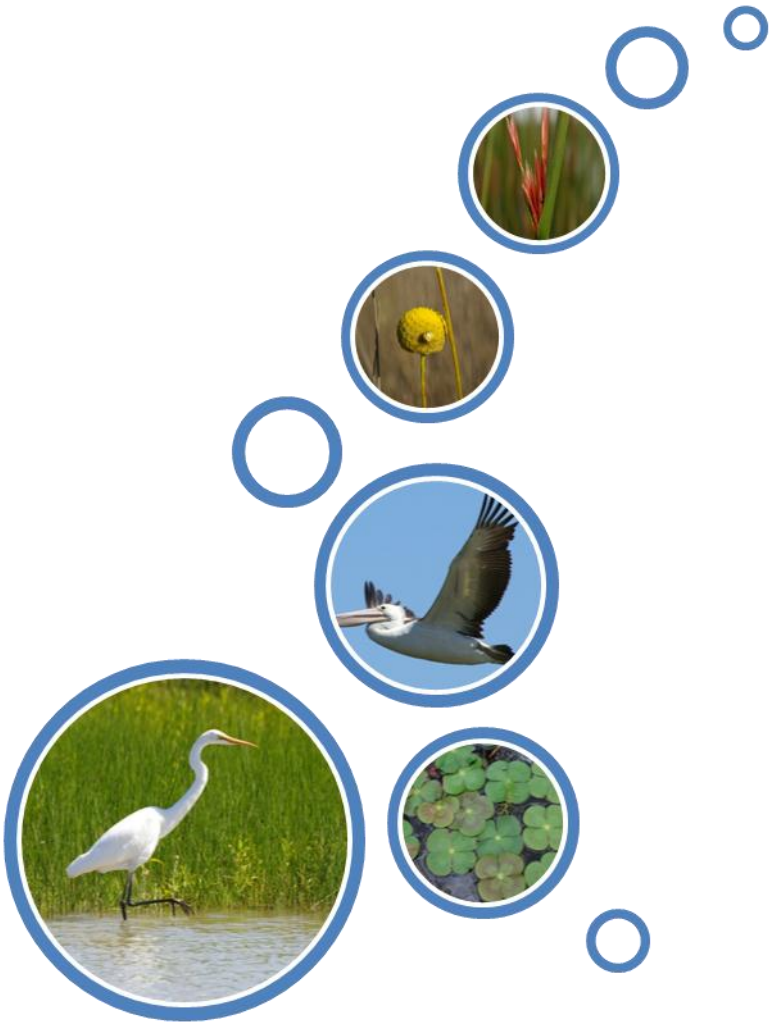
Goulburn Broken Catchment Wetlands

Seasonal Watering Proposal 2012-2013



GOULBURN BROKEN
CATCHMENT MANAGEMENT AUTHORITY

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Executive summary

This proposal outlines the priority watering actions for Black Swamp, Doctors Swamp, Kinnairds Swamp, Moodies Swamp, Reedy Swamp and the Corop wetland system in 2012-2013. Currently, these are the only natural wetlands in the Goulburn Broken Catchment that can physically and legally receive environmental water with the exception of Barmah Forest, which is not considered in this proposal.

Black Swamp, Doctors Swamp, Kinnairds Swamp, Moodies Swamp, Reedy Swamp and the Corop wetland system have experience prolonged inundation far in excess of their desired durations. Therefore, the priority watering action for these wetlands is to promote a drying phase to protect the diversity and structure of their vegetation communities. However, environmental water may be required to maintain water levels in Black Swamp, Kinnairds Swamp, Moodies Swamp and Reedy Swamp if a significant waterbird breeding events occur. Waterbirds may abandon nesting sites if surrounding water levels decrease dramatically or water depths become too shallow. The decision to deliver environmental water to these wetland to support a bird breeding event will consider the ecological benefits of the bird breeding event and the potential impact the environmental water may have on the vegetation. However, due to the significant and long term impact delivering environmental water may have on wetland vegetation at Doctor Swamp and the inability to effectively manage environmental water within the Corop Wetland System, environmental water will not be delivered to these wetlands to support bird breeding.

Table 1 below outlines the potential volume of water required for wetlands in the Goulburn Broken Catchment in 2012-2013 under a range of planning scenarios.

Table 1: Priority watering actions under a range of planning scenarios in the Goulburn Broken Wetlands

SCENARIO DESCRIPTION	DRY 70% POE	AVERAGE 50% POE	WET 30% POE
Environmental Objectives	Maintain or improve the condition of aquatic vegetation communities	Maintain or improve the condition of aquatic vegetation communities	Maintain or improve the condition of aquatic vegetation communities
	Maintain waterbird breeding habitat	Maintain waterbird breeding habitat	Maintain waterbird breeding habitat
Priority Watering Actions	Promote drawdown and drying	Promote drawdown and drying	Promote drawdown and drying
	Maintain water levels to support bird breeding	Maintain water levels to support bird breeding	Maintain water levels to support bird breeding
Delivery Timing	Dependent on breeding events (spring/summer watering)	Dependent on breeding events (spring/summer watering)	Dependent on breeding events (spring/summer watering)
Estimated Volume of Environmental Water Required	2,112.5 ML	1,056.25 ML	1,056.25 ML

1 Background and system overview

1.1 Introduction

This seasonal watering proposal outlines the priority environmental water requirements of wetlands in the Goulburn Broken Catchment in 2012-2013 to protect or enhance their environmental values and health. Seasonal watering proposals are required under Section 192A of the Water Act (1989). Environmental water holdings are held by the Victorian Environmental Water Holder (VEWH), who is responsible for decisions on their use. As such, this seasonal watering proposal for wetlands in the Goulburn Broken Catchment will be used by the VEWH to inform the development of the Seasonal Watering Plan 2012-2013.

1.2 System overview

The Goulburn Broken Catchment comprises the catchments of the Goulburn and Broken River. The catchment covers a total of 2,391,544 hectares or 10.5 per cent of Victorias total land area (Figure 1) and approximately two per cent of the Murray Darling Basins total land area (DNRE 2002). Within the Goulburn Broken Catchment approximately 2,000 natural wetlands have been recorded including a number of wetlands formally recognised for their conservation significance. These include the internationally significant Barmah Forest Ramsar site, ten wetlands of national significance listed in A Directory of Important Wetlands in Australia (EA 2001) and 111 wetlands of bioregional significance identified for the National Land and Water Resource Audit (CoA 2002). In addition, a large number of wetlands support state and nationally threatened biota and communities, and birds listed on international agreements and conventions.

Of the natural wetlands in the catchment only ten can physically and legally receive environmental water. These are Barmah Forest, Black Swamp, Doctors Swamp, Kinnairds Swamp, Moodies Swamp, Reedy Swamp, One Tree Swamp, Two Tree Swamp, Wallenjoe Swamp and Mansfield Swamp. One Tree Swamp, Two Tree Swamp, Wallenjoe Swamp and Mansfield Swamp form a large hydrologically connected wetland system known as the Corop Wetland System. A separate seasonal watering proposal will be prepared for Barmah Forest, and therefore is not considered in the development of this proposal.

1.2.1 Black Swamp

Black Swamp is a 16.5 hectare red gum swamp managed by Parks Victoria (see Appendix 1). Environmental water can be delivered by a water delivery channel connected to the swamp from the Nine Mile Creek. Black Swamp is bioregionally significant and contains a significant population of the EPBC (1999) listed River swamp Wallaby-grass. Environmental flows can only be delivered to the swamp when flows in the Nine Mile Creek exceed 100ML/day. This regularly occurs during the irrigation season (August – May). Nine Mile Creek flows sufficient to naturally inundate the wetland (approximately 400 ML/day) still occur on a regular basis (SKM, 2007). Therefore, the wetland may only require environmental water during extended dry periods or to enhance natural inundation events to ensure the success of bird breeding events or to provide optimal growth conditions for water dependent vegetation.

1.2.2 Doctors Swamp

Doctors Swamp is a 200 hectare red gum swamp managed by Parks Victoria (see Appendix 1). It is a bioregionally significant swamp and is considered one of the most intact red gum swamps in Victoria (Cook et al 2010). Environmental water can delivered to the swamp via an inlet on the Cattanach Canal and can only be delivered to the swamp when the Cattanach Canal is running at full capacity. Flow in the Cattanach Canal is influence by the operation of Waranga Basin. During spring flow can be inconsistent, which limits delivery opportunities. Flow is often more consistent during summer, autumn and winter providing greater delivery opportunities. The surrounding catchment is largely unmodified, so the wetland receives a near natural flood regime. Consequently, the wetland may only require environmental water during extended dry periods or to enhance natural inundation events to ensure the success of bird breeding events or to provide optimal growth conditions for water dependent vegetation.

1.2.3 Kinnairds Swamp

Kinnairds Swamp is a 96 hectare red gum swamp managed by Goulburn-Murray Water and Moira Shire (see Appendix 1). It is a significant wetland for Royal Spoonbill breeding and has the largest known recorded

population of the EPBC (1999) listed Rigid Water Milfoil (Myriophyllum porcatum). Water can be delivered to the swamp via the Murray Valley 5/3 (MV 5/3) channel which outfalls into the Muckatah Main drain and flows directly into Kinnairds Swamp. The delivery of environmental water depends upon irrigation demands and can only occur when there is spare channel capacity. Past environmental water allocations have seen agreements between Goulburn-Murray Water and the Goulburn Broken Catchment Management Authority to allow the MV 5/3 channel to operate after the irrigation. This has allowed efficient and effective environmental water delivery to the swamp. Due to significant changes to natural flow paths in the surrounding catchment and the regulation of the Broken Creek, the wetland may only receive flood water during wet years. Therefore, the wetland may require environmental water to provide a more natural flooding regime and enhance natural inundation events to ensure the success of bird breeding events or to provide optimal growth conditions for water dependent vegetation.

1.2.4 Moodies Swamp

Moodies Swamp is a 180 hectare cane-grass wetland managed by Parks Victoria (see Appendix 1). It is listed under A Directory of Important Wetlands in Australia (EA, 2001) as part of the Broken Creek listing, is a significant Brolga breeding area and contains a large population of the EPBC (1999) listed Rigid Water Milfoil (Myriophyllum porcatum). Water can be delivered to the swamp via a water delivery channel from the Broken Creek. Currently Moodies Swamp may only receive 47 ML of Commonwealth environmental water (Commonwealth Water Share – Broken system). There has been no survey or modelling of catchment conditions to determine changes to the natural frequency and duration of flooding events at Moodies Swamp. However, it is likely the frequency and duration of flooding at Moodies Swamp has been reduced by the regulation of the Broken River and Broken Creek (SKM, 2006). Therefore, the wetland may require environmental water to provide a more natural flooding regime and enhance natural inundation events to ensure the success of bird breeding events or to provide optimal growth conditions for water dependent vegetation.

1.2.5 Reedy Swamp

Reedy Swamp is a 130 hectare deep freshwater marsh on the Goulburn River and is listed under A Directory of Important Wetlands in Australia (EA 2001) as part of the lower Goulburn River Floodplain listing (see Appendix 1). Reedy Swamp is part of the Lower Goulburn National Park and is managed by Parks Victoria. It contains a mosaic of Ecological Vegetation Classes (EVCs) including Tall Marsh, Floodway Pond Herbland and Rushy Riverine Swamp. Reedy Swamp is an important colonial nesting waterbird breeding site and drought refuge. Environmental water can be delivered to the wetland via the Central Goulburn Channel 19/12 (CG 19/12), which outfalls into Shepparton Drain 3. Shepparton Drain 3 can then be diverted into Reedy Swamp. The delivery of environmental water depends upon irrigation demands and can only occur when there is spare channel capacity. Past environmental water allocations have seen agreements between Goulburn-Murray Water the Goulburn Broken Catchment Management Authority and Parks Victoria to allow the CG 19/12 channel to remain open after the irrigation season. This has allowed efficient and effective environmental water delivery to the swamp. Goulburn River flows sufficient to naturally inundate the wetland (approximately 20,000 ML/day) still occur on a regular basis. Therefore, the wetland may only require environmental water during extended dry periods or to enhance natural inundation events to ensure the success of bird breeding events or to provide optimal growth conditions for water dependent vegetation.

1.2.6 Corop Wetland System

The Corop Wetland System is 1,572 ha wetland complex comprising the hydrologically connected One Tree Swamp (631 hectares), Two Tree Swamp (82 hectares), Wallenjoe Swamp (359 hectares) and Mansfield Swamp (500 hectares) (see Appendix 1). The wetlands are managed by Parks Victoria and are listed under A Directory of Important Wetlands in Australia (EA, 2001) as part of the Wallenjoe Wetlands listing. They are valued for their size, rarity, species diversity and waterbird habitat. Of note, One Tree and Two Tree Swamps provide important breeding habitat for Brolga and One Tree Swamp is the largest cane grass wetland in the Goulburn Broken Catchment. Environmental water can be delivered to the wetland swamp from the Waranga Western Main Channel at Groves Weir. The weir can be opened to allow environmental flows into Wanalta Creek which terminates at One Tree Swamp. The natural flow paths connecting the four wetlands have been modified to improve their hydrological efficiency. As a result the depth and duration of flooding can not be actively managed at each wetland with the exception of Mansfield Swamp at the terminal end of the system. Therefore, any environmental water delivered to the system would fill and spill the wetlands in turn. Under

Stage 2 of the NVIRP, the Commonwealth Government funded the design and construction of regulating structures so the depth and duration of flooding in One Tree and Two Tree Swamps can be controlled. The NVIRP are expected to be complete the works in 2014 with the assistance and advice of the Goulburn Broekn CMA and G-MW. Due to regulation of the Wanalta Creek the wetland system may only receive flood water during wet years. Therefore, the wetland system may require environmental water to provide a more natural flooding regime and enhance natural inundation events to ensure the success of bird breeding events or to provide optimal growth conditions for water dependent vegetation.

1.3 Water resources

Victorian wetlands can receive environmental water from a number of sources including entitlements held by the Victorian Environmental Water Holder, Parks Victoria, Murray Darling Basin Authority (The Living Murray) and Commonwealth Environmental Water Holder. In addition, Victorian wetlands can receive donations of water from individuals, community groups and organisations. Wetlands in the Goulburn Broken Catchment may receive environmental water from the entitlements outlined in Table 2 below.

Table 2: Environmental water available for use in Goulburn Broken Catchment wetlands

Entitlement	HR Volume (ML)	LR Volume (GL)	Management Responsibility
Victorian River Murray Flora and Fauna Bulk Entitlement [1]	27,600.0	34,000.0	VEWH
Goulburn System Environmental Water Reserve Bulk Entitlement[2]	TBD	TBD	VEWH
Goulburn River Environmental Entitlement 2010[3]	1432.0	0.0	VEWH
Shepparton Modernisation Project[4]	1,500.0	7,600.0	VEWH
One Tree Swamp Bulk Entitlement[1]	9.3	0.0	Parks Victoria
Gaynor Swamp Bulk Entitlement[1]	28.7	11.5	Parks Victoria
Stockyard Plain Bulk Entitlement[1]	112.0	0.0	DSE
Commonwealth Water Share (Broken system)[5]	47.0	4.0	MDBA
Commonwealth Water Share (Goulburn system)[1]	100,455.0	10,527.0	CEWH
	131,184.0	52,142.5	

1 The water can be used to supply wetlands connected to supply networks of the Murray River, Goulburn River and lower Broken Creek.
2 Currently supply is by agreement with G-MW. The volume is not fixed and is based on the water saved in the previous year by the NVIRP, which is influenced by climate affected losses. The water will be turned into a fixed volume entitlement when the NVIRP is finished. The water can be used to supply water to wetlands connected to supply networks of the Murray River, Goulburn River and lower Broken Creek.
3 Held in Lake Eildon but specified at Loddon Weir. The water can be used to supply wetlands connected to supply networks of the Murray River, Goulburn River and lower Broken Creek.
5 The entitlement may not be ready for use in 2012-2013.
4 The water can be used to supply wetlands connected to supply networks of the lower Broken River and upper Broken Creek.

Figure 1: Priority wetlands the Goulburn Broken Catchment

2 Ecological and hydrological objectives

Ecological and hydrological objectives have been established in Environmental Water Management Plans for each of the nine wetlands considered in this proposal. The objectives were developed by a Scientific Technical Committee comprised of local agency staff and specialist wetland consultants. These ecological and hydrological objectives are outlined in Table 3.

Of particular relevance to this proposal, each wetland has an ecological objective to provide opportunities for waterbird breeding or maintain waterbird breeding habitat. In addition, they have hydrological objectives that identify maximum ponding durations to improve or maintain their respective vegetation communities. These maximum ponding durations vary from 8 months to 18 months.

Table 3: Ecological and hydrological objectives wetlands in the Goulburn Broken Catchment

Asset	Ecological Objectives	Water management area	Hydrological objectives											
			Recommended number of events in 10 years			Tolerable interval between events once wetland is dry (months)			Duration of ponding (months)			Preferred timing of inflows	Volume to fill to target supply level (ML)	Depth (mm)
			Min	Opt	Max	Min	Opt	Max	Min	Opt	Max			
BLACK SWAMP														
Vegetation	Improve the diversity of native wetland flora species to be consistent with Red Gum Swamp EVC benchmarks	Wetland body and riparian zone	2	5-7	10	3	6	54	2	6	18	Late Autumn – Spring or spring summer for more growth	90	Variable to 500mm
Birds	Provide opportunities for waterbird breeding	Wetland body	3	10	10	6	9	12	6	8	NA	Spring	90	Maximum of 500mm
DOCTORS SWAMP														
Vegetation	Maintain diversity of native wetland flora species to be consistent with Red Gum Swamp EVC benchmarks.	Wetland body and riparian zone	2	5-7	10	3	6	54	2	6	18	Late Autumn – Spring	1284	Variable to 600mm
Birds	Provide opportunities for waterbird breeding.	Wetland body	3	10	10	6	9	12	6	8	NA	Spring	1284	Variable to 600mm

KINNAIRDS SWAMP													
Vegetation	Improve the diversity of native wetland flora species to be consistent with Red Gum Swamp EVC benchmarks.	Wetland body and riparian zone	2	5-7	10	3	6	54	2	6	18	Late Autumn – Spring or spring summer for more growth	482.5	Variable to 500mm
Vegetation	Improve the diversity of native wetland flora species to be consistent with Plains Grassy Wetland EVC benchmarks.	Wetland body and riparian zone	3	5-7	10	6	6	42	3	6	9	Late Autumn – Spring	482.5	Variable to 500mm
Vegetation	Maintain populations of rigid water-milfoil and slender water-milfoil.	Floodway and Wetland body	NA	NA	NA	NA	NA	12	NA	NA	NA	Late Autumn	482.5	Variable to 500mm
Birds	Provide opportunities for waterbird breeding especially Royal Spoonbills and Australasian Shoveler	Wetland body	3	10	10	6	9	12	6	8	NA	Spring	482.5	
MOODIES SWAMP														
Vegetation	Maintain Cane-grass Swamp EVC.	Wetland body and riparian zone	3	5	10	6	6-9	36	3	6	9	Autumn – Spring	720	Variable to 400mm
Birds	Provide opportunities for waterbird breeding especially Brolga.	Wetland body	5	5	10	6	9	12	2	6	NA	Spring	720	Variable to 400mm
REEDY SWAMP														
Vegetation	Improve the diversity of native wetland flora species to be consistent with mosaic of EVC benchmarks.	Wetland body and riparian zone	4	6	10	4	6-10	12-18	6	6-10	12-18	Autumn – Spring	1264	Variable to 1000mm

Birds	Maintain habitat for waterbird breeding especially Royal Spoonbills and Ibis.	Wetland body	4	6	10	4	6-10	12	6	4-9	NA	Spring	1264	Variable to 10000mm
ONE TRE AND TWO TREE SWAMPS														
Vegetation	Maintain Cane-grass Swamp and Cane-grass wetland/ plains grassy wetland complex EVCs of One Tree and Two Tree Swamp.	Wetland body and riparian zone	3	5	10	6	6-9	36	3	6	9	Autumn – Spring	2524 ML One Tree 328 ML Two Tree	Variable to 400mm
Vegetation	Maintain Lignum Swamp EVC at Two Tree Swamp.	Wetland fringe	1	1	1	8	8	8	2	2-8	8	Spring - summer	328 ML Two Tree	Variable to 400mm
Birds	Provide opportunities for waterbird breeding especially Brolga.	Wetland body	5	5	10	6	9	12	2	6	NA	Spring	2524 ML One Tree 328 ML Two Tree	Variable to 400mm
WALLENJOE SWAMP														
Vegetation	Maintain diversity of native wetland flora species to be consistent with Red Gum Swamp EVC benchmarks.	Wetland body and riparian zone	2	5-7	10	3	6	54	2	6	18	Late Autumn – Spring	5242	Variable to 1000mm
Birds	Provide opportunities for waterbird breeding.	Wetland body	3	10	10	6	9	12	6	8	NA	Spring	5242	Variable to 1000mm
MANSFIELD SWAMP														
Vegetation	Maintain Cane-grass Swamp EVC benchmarks.	Wetland body and riparian zone	3	5	10	6	6-9	36	3	6	9	Autumn – Spring	5349	Variable to 500mm
Vegetation	Maintain Red Gum Swamp EVC benchmarks.	Wetland body and riparian zone	2	5-7	10	3	6	54	2	6	18	Late Autumn – Spring	5349	Variable to 500mm

Birds	Provide opportunities for waterbird breeding especially Brolga.	Wetland body	5	5	10	6	9	12	2	6	NA	Spring	5349	Variable to 500mm

3 Current situation and priority watering actions

3.1 Current situation

Above average and unseasonal rainfalls since March 2010 has resulted in many wetlands across the Goulburn Broken Catchment being regularly inundated for short and prolonged periods. In most instances this has been a welcome reprieve, as many wetlands across the Goulburn Broken Catchment were previously dry for ten years. However, prolonged inundation can temporarily or permanently alter wetland vegetation communities by favouring species adapted to extended inundation, reducing the diversity and structure of habitat. Of particular concern, River Red Gums can die as a result of waterlogging and a mature hollow bearing River Red Gum may take over 100 years to grow.

Black, Kinnairds, Moodies, One Tree, Two Tree, Mansfield and Wallenjoe Swamps are all currently full and have held water for approximately 24 months. They are expected to hold water until early summer 2012, which will extend their inundation to approximately 30 months. Reedy Swamp is also currently full and is expected to hold water until early summer 2012. In the last 11 years it has only had one brief drying phase in 2006-2007. All the wetlands are therefore expected to far exceed their desired maximum ponding durations in 2012-2013. Therefore, the drawdown and drying of all the wetlands is desired in 2012-2013 to protect the diversity and structure of their vegetation communities. Due to the threat of River Red Gums dying at Doctors Swamp from waterlogging, the Goulburn Broken Catchment Management Authority with the support of Parks Victoria is planning to drawdown the wetland using exiting regulating infrastructure. Regulating infrastructure can also be used to augment natural drawdown rates to various degrees at Black, Kinnards and Reedy Swamps, which may also be considered.

Table 4 outlines the historical and predicted hydrological condition of wetlands in the Goulburn Broken Catchment and when they received environmental water.

Table 4: Historical and predicted hydrological condition of wetlands in the Goulburn Broken Catchment

WETLAND	2001 2002	2002 2003	2003 2004	2004 2005	2005 2006	2006 2007	2007 2008	2008 2009	2009 2010	2010 2011	2011 2012	2012 2013*
Black Swamp												
Doctors Swamp												
Kinnairds Swamp												
Mansfield Swamp												
Moodie's Swamp												
One Tree Swamp												
Reedy Swamp												
Two Tree Swamp												
Wallenjoe Swamp												

Legend

Met water regime requirements

Partly met water regime requirements

Dry

Exceeded maximum ponding duration

Environmental water supplied

* Predicted hydrological condition

3.2 Priority watering actions

Wetlands within the Goulburn Broken catchment have experience prolonged inundation far in excess of their desired durations. To protect the diversity and structure of their vegetation communities the wetlands need to drawdown and dry. However, environmental water may be required to maintain water levels in wetlands if a significant waterbird breeding events occur. Waterbirds may abandon nesting sites if surrounding water levels decrease dramatically or water depths become too shallow. The decision to deliver environmental water to a wetland to support a bird breeding event will need to consider the ecological benefits of the bird breeding event and the potential impact the environmental water may have on the vegetation. However, due to the significant and long term impact the death of River Red Gums would have on the ecological values of Doctor Swamp, the delivery of environmental water to the wetland to support a bird breeding event is not considered desirable under any circumstance.

Due to the current inability to effectively manage environmental water within the Corop Wetland System, the delivery of environmental water to maintain a bird breeding event is not considered in this proposal.

The need to maintain water levels in a wetland to support a bird breeding event is likely to occur between October and January, which coincides with key waterbird breeding cycles. The total evaporation rate in Shepparton between these months is approximately 500 mm. Approximately 2,112 ML is required to maintain water levels in Black, Kinnairds, Moodies and Reedy Swamps between October and January in dry years (Table 5). In average and wet years when natural inflows may compensate for evaporation losses only half this volume may be required.

Table 5: Predicted water requirements

WETLAND	AREA (Ha)	VOLUME REQUIRED TO COMPENSATE FOR 500 MM OF EVAPORATION (ML)
Black Swamp	16.5	82.5
Kinnairds Swamp	96	480
Moodies Swamp	180	900
Reedy Swamp	130	650
Totals	**422.5**	**2,112.5**

Note: volume required = wetland area x evaporation(500mm)/100

4 Scenario planning and adaptive management

4.1 Scenario planning

The need and use of environmental water will often vary according to climatic conditions. In drier periods, restricted water resources and natural inflows may limit the ecological and hydrological objectives that can be realistically provided for a wetland through environmental water management. However, in wetter periods the desired ecological and hydrological objectives of a wetland may be largely met by natural inflows and only small volumes of environmental water may be required. Therefore, how environmental water management priorities and required volumes of environmental water may change under different climatic scenarios is considered below in Table 6. The scenarios are based on receiving catchment inflows with a particularly Probability of Exceedence (POE) and the likely availability of environmental water. The scenarios are dry (70% POE), average (50% POE) and wet (30% POE). These scenarios were chosen as they may result in different natural inflows to the wetlands and the volume of environmental water required. Due to the recent and existing condition of the wetlands the environmental objectives and priority watering actions do not vary across the scenarios.

Table 6: Scenario summary for Goulburn Broken Catchment wetlands

SCENARIO DESCRIPTION	DRY 70% POE	AVERAGE 50% POE	WET 30% POE
Water Supply	100% HRWS allocations Perhaps 60% available as private carryover	100% HRWS allocations Perhaps 40% available as private carryover	100% HRWS allocations Perhaps 10% available as private carryover
	Operation of irrigation network is unlikely to restrict water delivery	Operation of irrigation network is unlikely to restrict water delivery	Operation of irrigation network is unlikely to restrict water delivery
Expected Wetland Inflow	No natural flooding of Black Swamp	Black Swamp may fill from natural flooding	Black Swamp may fill from natural flooding
	No natural flooding of Doctors Swamp	Doctors Swamp may fill from natural flooding	Doctors Swamp may fill from natural flooding
	No natural flooding of Kinnairds Swamp	Kinnairds Swamp may partially fill from natural flooding	Kinnairds Swamp may fill from natural flooding
	No natural flooding of Moodies Swamp	Moodies Swamp may partially fill from natural flooding	Moodies Swamp may fill from natural flooding
	No natural flooding of Reedy Swamp	Reedy Swamp may fill from natural flooding	Reedy Swamp may fill from natural flooding
Environmental Entitlement Volumes Available	CEWH – 111 GL VEWH – 72 GL	CEWH – 111 GL VEWH – 72 GL	CEWH – 111 GL VEWH – 72 GL
Environmental Objectives	Maintain or improve the condition of aquatic vegetation communities	Maintain or improve the condition of aquatic vegetation communities	Maintain or improve the condition of aquatic vegetation communities
	Maintain waterbird breeding habitat	Maintain waterbird breeding habitat	Maintain waterbird breeding habitat
Priority Watering Actions	Promote drawdown and drying	Promote drawdown and drying	Promote drawdown and drying
	Maintain water levels to support bird breeding	Maintain water levels to support bird breeding	Maintain water levels to support bird breeding
Delivery Timing	Dependent on breeding events (spring/summer watering)	Dependent on breeding events (spring/summer watering)	Dependent on breeding events (spring/summer watering)
Estimated Volume of Environmental Water Required	2,112.5 ML	1,056.25 ML	1,056.25 ML

4.2 Adaptive management

The decision to deliver environmental water to Black, Kinnairds, Moodies and Reedy Swamps will be based on waterbird breeding activity and the potential impact environmental water delivery may have on wetland vegetation. The decision will give consideration to the following ecological influences and will be made in consultation with Parks Victoria, G-MW the Moira Shire and other key stakeholders:

- **The number and conservation status of breeding waterbirds**.
  Waterbird abundance has significantly declined across Victoria and much of the Murray-Darling Basin (Birds Australia 2008). Providing waterbird breeding opportunities is therefore important, particularly for threatened species. For more abundant species 100+ breeding pairs may be considered important to support. However, 1 pair of breeding Brolga may be considered important to support due to their small population.

- **The sensitivity of waterbirds to water level changes**.
  The sensitivity of waterbirds to water level changes is dependent upon their nesting and rearing strategies. Altrical (birds which hatch in a relatively underdeveloped state and stay in the nest are tendered by adults) reed nesters (e.g. ibis and spoonbills) are most sensitive to changes in water level followed by altrical tree nesters (e.g. cormorants). Precocial (birds which hatch in a relatively advanced and mobile state and are capable of leaving the nest) reed nesters (e.g. Brolga, swans and coots) are less sensitive to changes in water levels and precocial tree nesters are least sensitive (e.g. ducks).

- **Bird breeding phase**.
  If waterbirds are in the lag phase (nest building and feeding) drawdown and drying of the wetland could be promoted to discourage waterbirds from continuing to breed. The drawdown and drying of wetlands in later phases of bird breeding (egg laying and incubation; nesting; and fledging) poses a risk to the survival of waterbird chicks.

- **Wetland water level**.
  The wetland water level in conjunction with the bird breeding phase will influence the need for environmental water and the amount required. For example, if a wetland is relatively full and waterbird breeding is at the nesting phase, environmental water may not be required to ensure waterbirds fledge. The length of each breeding phase can vary between waterbird species and will be considered in the decision making process.

- **The availability of alternative waterbird breeding habitat**.
  The more waterbird breeding habitat available across the catchment and the Murray-Darling Basin the less critical it will be to support a bird breeding event in Black, Kinnairds, Moodies and Reedy Swamps. Some waterbird species such as Brolga have preferred breeding locations and will be considered in assessing the availability of alternative waterbird breeding habitat.

- **The impact on wetland vegetation**.
  Wetland vegetation is critical to many wetland functions. Therefore, environmental water will not be delivered to a wetland to support waterbird breeding if it may result in long-term and significant changes to the structure and composition of the vegetation. The type and condition of wetland vegetation at Black, Kinnairds, Moodies and Reedy Swamps varies along with their inundation histories. These factors will influence the potential impact environmental water delivery may have on the wetland vegetation. For example, in the last 11 years Reedy Swamp has only dried briefly in 2006-2007. As a result the wetland vegetation is in poor condition and delivering environmental water to the wetland is unlikely to have a significant or long term impact on the vegetation.

The above ecological influences may change at each wetland during the bird breeding season and will need to be continually reviewed, along with the capacity to deliver environmental water requirements.

5 Implementation arrangements

5.1 Notice and time requirements

A notice period of one to two days minimum and preferably four days is required for environmental water orders from Goulburn system storages. If constraints in making environmental water available are foreseen by G-MW, the Environmental Water Manager will be advised accordingly. The physical delivery of environmental water to the wetlands may only take 1-3 days during the irrigation season depending on system demands. In addition, Black Swamp can only receive environmental water when flow in the Nine Mile Creek is above 100 ML/day (which regularly occurs during the irrigation season) and Doctors Swamp can only receive environmental water when the Cattanach Canal is running at full capacity. Flow in the Cattanach Canal is influence by the operation of Waranga Basin. During spring flow can be inconsistent limiting delivery opportunities. Flow is often more consistent during summer, autumn and winter providing greater delivery opportunities.

The Goulburn Broken Catchment Management Authority will coordinate any planned delivery of environmental water with the VEWH, G-MW, Moira Shire and Parks Victoria. Further delivery arrangements will be outlined in delivery plans.

6 Risk management

The risks associated with the proposed delivery of environmental water to the five wetlands in the Goulburn Broken Catchment during spring and summer to maintain waterbird breeding habitat include: the resource manager being unable to deliver the required flow rates; improving conditions for non-native species; and the environmental water account becoming overdrawn. For all the five wetlands these have been assessed as a medium risk while remaining risks have been assessed as low (Table 7).

The likely hood of any risk event occurring before or during an environmental water delivery was predominately assessed as either Rare (1) or Unlikely (2). However, the consequences of some of these risks if they did happen were assessed as moderate (3) to serious (4).

Table 7: Risk assessment for the Goulburn Broken Wetlands

RISK CATEGORY	Risk #	Risk Type	FLOW COMPONENT	
			Spring release	Summer release
			Risk rating	Risk rating
Quality issues lead to non-achievement of objectives	1.0	Release volume is insufficient in meeting required flow at target point	Low	Low
	1.1	Current recommendations on environmental flows at target point	Low	Low
	1.2	Storage operator maintenance works affect ability to deliver water	Low	Low
	1.3	Resource manager cannot deliver required flow rate (outlet/ capacity constraints, insufficient storage volume)	Medium	Medium
Time	2.0	Limited CMA resource to deliver environmental release	Low	Low
Cost	3.0	Cost of delivery exceeds available funding	Low	Low
Human	4.0	Environmental release causes personal injury to river users	Low	Low
Environmental	5.0	Releases cause water quality issues	Low	Low
	5.1	Improved conditions for non-native species	Medium	Medium
Compliance	6.0	Environment water account is overdrawn	Medium	Medium
	6.1	Environmental release causes flooding on private land	Low	Low
	6.2	Environmental release causes flooding to public infrastructure	Low	Low

	6.3	Environmental release causes flooding of Crown Land	Low	Low
Reputation	7.0	Unable to provide evidence in meeting ecological objective	Low	Low
	7.1	Key stakeholders not supportive of environmental water release	Low	Low

Table 8 below outlines the mitigation strategies (where available) that will be employed by the Goulburn Broken Catchment Authority to address the medium risks identified above.

Table 8: Mitigation action plan

RISK #	RISK TYPE	MITIGATION STRATEGY
1.3	Resource manager cannot deliver required flow rate (outlet/ capacity constraints, insufficient storage volume)	Ongoing dialogue with G-MW regarding consumptive demand in the system, to assist in timing releases when there is available capacity to meet desired flow rates Low
5.1	Improved conditions for non-native species	There is currently no strategy to mitigate this risk. However, minimising summer inundation and placing carp screens on inlet channels can reduce the risk.
6.0	Environment water account is overdrawn	Ongoing dialogue with G-MW regarding the volume of water delivered so additional water uses can be identified in advance and negotiated with the VEWH

7 Monitoring, reporting and knowledge gaps

7.1 Monitoring

The Goulburn Broken Catchment Management Authority has formally monitored the ecological response of Black, Doctors, Kinnairds, Moodies, Reedy and One Tree, Two Tree, Wallenjoe and Mansfield Swamps to natural inundation events and environmental water deliveries since 2008. The monitoring has recorded:

- Waterbird species present, there approximate number and breeding activity.
- Frog species present, intensity of calling activity and breeding activity.
- Vegetation communities present, their species composition and percentage cover.
- Water quality (pH, EC, temperature and turbidity).
- Water depth and extent.
- Incidental flora and fauna sightings of interest.

Compliance monitoring is also undertaken during the delivery of environmental water. This includes monitoring regulator operation and the volume of water delivered. This has been complimented by regular field observations by staff and acoustic monitoring to help determine the presence and number of waterbirds and frogs, and wetland condition. The information collected has been invaluable in informing the ongoing management of these wetlands, and State Government and VEWH reporting.

In 2012-2013 waterbird breeding activity, and water depth and extent will be monitored at Black, Doctors, Kinnairds, Moodies, and Reedy Swamps on a regular basis (every 2-3 weeks) in spring and summer to determine when and if environmental water is required. If environmental water is delivered to a wetland these attributes will continue to be monitored along with the volume of water delivered. Particular attention will be paid to water levels to ensure nests are not exposed by water losses and nests close to the water surface are not inundated by environmental water deliveries. Monitoring of additional ecological attributes such as vegetation will be dependent upon available funding and staff resources.

7.2 Reporting

Weekly reporting is planned to advise environmental entitlement holders of:

- progressive water use;
- adaptive water deployment decisions made;
- the effectiveness of the environmental water deployed in achieving the desired flood depth, extent and duration; and
- bird breeding activity .

An annual report will be prepared at the end of the 2012-2013 year to collate all the information on the use of environmental water including the environmental outcomes achieved. The report will be provided to DSE and relevant environmental entitlement holders. The information in the report will also be used to inform the future management of wetlands in the catchment.

7.3 Knowledge gaps

One of the key knowledge gaps associated with wetland environmental water management in the Goulburn Broken Catchment is the limited information on the flood regime tolerances of aquatic dependent ecological vegetation communities and their associated flora species such as cane grass (Eragrostis infecunda) and the EPBC (1999) listed Rigid Water Milfoil (Myriophyllum porcatum). These knowledge gaps do not prevent environmental water being delivered to the wetlands. However, more information on the flood regime tolerances of aquatic dependent ecological vegetation communities and their associated flora species would help refine wetland flood regimes and the management of environmental water.

8 Communications and engagement

There are two key audiences for communications under the proposal. The primary audience is the agencies involved in delivering the proposed flow management and included Goulburn-Murray Water, the Victorian Environmental Water Holder and the Commonwealth Environmental Water Holder. It also includes the relative land managers including Parks Victoria, Goulburn-Murray Water and the Moira Shire.

Goulburn-Murray Water is the key flow delivery agency. When the final proposal for 2012-2013 is agreed, communications with Goulburn-Murray Water are aimed at making clear what the intended environmental delivery plans are and their intended purpose. Then, throughout the season, there will be regular communications (phone, email) directly with the water resource management group to understand potential delivery opportunities and constraints, and to organise environmental water deliveries.

The Victorian Environmental Water Holder will use the proposal as the basis (in whole or part), in developing the Seasonal Watering Plan. Water allocated is to be delivered in accordance with the plan and the plan is used to seek agreement from other water holders for the use of their water. Routine communication (phone, email) will report on the delivery of water under the plan, and seek to modify release plans to align with wetland needs as the year unfolds.

Commonwealth Environmental Water Holder may have allocated water to the Seasonal Watering Plan which is based on this proposal. Routine communication on the delivery of water under the plan will be via the Victorian Environmental Water Holder.

Parks Victoria is the land manager for all wetlands identified in this proposal with the exception of Kinniards Swamp, which is managed by G-MW and the Moira Shire. Following the approval of the proposal by the Goulburn Broken Catchment Management Authority Board the CMA will liaise with the land managers on its content, seek their advice on its implementation and seek formal written approval from them to implement the proposal.

The secondary audience is those potentially affected by or interested in the delivery of environmental water to wetlands. This group includes wetland advisory groups and the Yorta Yorta Nation Aboriginal Corporation. These groups will be consulted on the implementation of the seasonal watering proposal following its approval. If time permits they may also be consulted during the development of the proposal to provide local wetland knowledge.

To assist with the environmental water management program, the Goulburn Broken CMA is establishing Goulburn and Broken Environmental Water Advisory Groups to provide advice on planning environmental water use (including seasonal watering proposals and water management plans) and on any environmental health trends occurring in the rivers, creeks and wetlands. The group is expected to be established by the end of April 2012 and will comprise of members who will come from a range of geographic locations along the Goulburn and Broken Rivers or adjacent to wetlands. The group will also include representatives from key agency partners (such as the Department of Primary Industries, Department of Sustainability and the Environment, and Goulburn-Murray Water). In 2012-2013 the group will be informed and consulted on the implementation of the seasonal watering proposal following its assessment. In following years they will be consulted during the proposal's development.

In addition, the Goulburn Broken Catchment Management Authority will inform the broader community about the decision to provide environmental water to wetlands and what it is trying to achieve. The Goulburn Broken Catchment Management Authority will also seek to build a public understanding of how natural wetland flood regimes have changed and how we are using environmental water to improve wetland health. This will be achieved through media articles and talks directly with special interest groups.

Table 9 outlines the consultation process the Goulburn Broken Catchment Management authority has and will undertake during the development and implementation of this seasonal water proposal. All communication activities will be undertaken in accordance with the communication and media protocols of the VEWH.

Table 9: Seasonal watering proposal development and implementation consultation

STAKEHOLDER	PURPOSE	ENGAGEMENT TYPE	METHOD	TIMING
PROPOSAL DEVELOPMENT				
CMA Board	Approval of the proposal	Approve	Board Meeting Paper/Presentation	13 April 2012
PROPOSAL IMPLEMENTATION				
Yorta Yorta Nation Aboriginal Corporation	Inform the group on the proposal and seek advice on indigenous related issues	Inform/consult	Personal discussion with key staff	May 2012 – Feb 2013

Goulburn and Broken Environmental Water Advisory Groups	Inform the group on the proposal and seek advice on community and wetland management related issues	Inform/consult	Meetings	May 2012 – Feb 2013
Parks Victoria (wetland land manager)	Inform Parks Victoria on the proposal, seek their advice on its implementation and seek their approval to implement the proposal	Inform/consult/approve	Meetings and a letter seeking formal approval to implement the proposal	May 2012 – Feb 2013
Moira Shire (Kinnairds Swamp land manager)	Inform Moira Shire on the proposal, seek their advice on its implementation and seek their approval to implement the proposal	Inform/consult/approve	Meetings and a letter seeking formal approval to implement the proposal	May 2012 – Feb 2013
GB CMA wetland advisory group	Inform the group on the proposal and seek advice on community and wetland management related issues	Inform/consult	Meetings	May 2012 – Feb 2013
Local wetland advisory or interest groups	Inform the group on the proposal and seek advice on community and wetland management related issues	Inform/consult	Meetings	May 2012 – Feb 2013
VEWH	Report on deployment of water under the plan, and seek to modify release plans to align with wetland needs as the year unfolds	Inform/consult	Telephone and email	May 2012 – Feb 2013
G-MW	To understand unregulated flows, planned consumptive use releases, and to organise environmental water delivery	Inform/consult	Telephone and email	May 2012 – May 2013
G-MW (Kinnairds Swamp land manager)	Inform Moira Shire on the proposal, seek their advice on its implementation and seek their approval to implement the proposal	Inform/consult/approve	Meetings and a letter seeking formal approval to implement the proposal	May 2012 – Feb 2013

9 Approval

I, the authorised representative of the agency shown below, approve the Seasonal Watering Proposal for Goulburn Broken Catchment Wetlands 2012-13.

SIGNED FOR AND ON BEHALF OF THE GOULBURN BROKEN CATCHMENT MANAGEMENT AUTHORITY

Signature of authorised representative

Name of authorised representative

Date:

10 References

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11 Glossary and acronyms

Catchment management authority – statutory authorities established to manage regional and catchment planning, waterways, floodplains, salinity and water quality

CEWH – Commonwealth Environmental Water Holder

CMA – Catchment Management Authority

Commonwealth Environmental Water Holder (CEWH) – (part of the Department of Sustainability, Environment, Water, Populations and Communities) holds and manages the water entitlements purchased through the Restoring the Balance water recovery program

Environmental water entitlement – an entitlement to water to achieve environmental objectives in waterways (could be an environmental entitlement, environmental bulk entitlement, water share, section 51 license or supply agreement)

EPBC– Environmental Protection Biodiversity Conservation Act 1999

EVC – Ecological Vegetation Class

GB CMA - Goulburn Broken Catchment Management Authority

Gigalitre (GL) – one billion (1,000,000,000) litres

G-MW– Goulburn-Murray Water

High-reliability entitlement – legally recognised, secure entitlement to a defined share of water, as governed by the reserve policy (full allocations are expected in most years)

Low-reliability entitlement – legally recognised, secure entitlement to a defined share of water, as governed by the reserve policy (full allocations are expected only in some years)

Macrophytes – an aquatic plant that grows in or near water and is emergent, submergent, or floating

Megalitre (ML) – one million (1,000,000) litres

Seasonal allocation – the volume of water allocated to a water share in a given season, expressed as a percentage of total entitlement volume

Victorian Environmental Water Holder – an independent statutory body responsible for holding and managing Victorian environmental water entitlements and allocations (Victorian Water Holdings)

Water entitlement – the right to a volume of water that can (usually) be stored in reservoirs and taken and used under specific conditions

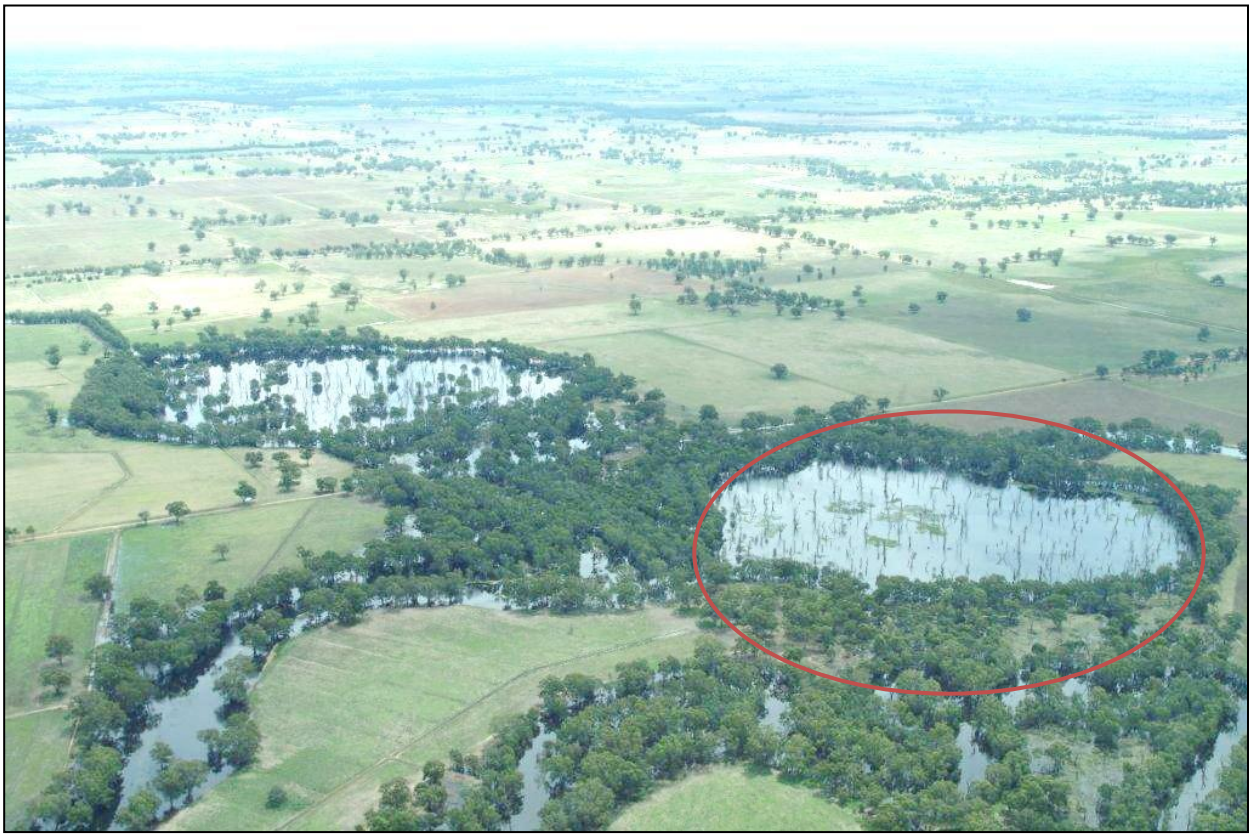
Water Holdings – environmental water entitlements held by the Victorian Environmental Water Holder

Waterway manager – agency responsible for the environmental management of waterways (includes catchment management authorities and Melbourne Water)

Waterways – can include rivers, wetlands, creeks, floodplains and estuaries

Appendix 1: Wetland photographs

Photograph 1: Black Swamp circled in red



Photograph 2: One Tree Swamp circled in blue and Two Tree Swamp circled in red

Photograph 3: Wallenjoe Swamp in foreground and Mansfield swamp in the background

Photograph 4: Mansfield Swamp in the foreground

Photograph 5: Reedy Swamp

Photograph 6: Kinnairds Swamp

Photograph 7: Doctors Swamp

Photograph 8: Moodies Swamp