

North Central CMA Regional Catchment Strategy: Draft Wetlands Discussion Paper

1. Preamble

The North Central Regional Catchment Strategy (RCS) is the principle framework for land, water and biodiversity management in North Central Victoria. This discussion paper has been written to assist in the development of the North Central RCS. The discussion paper attempts to articulate our current understanding of particular issues or assets including setting priorities and will be used to seek feedback and guide future direction setting in the RCS.

The Department of Sustainability and Environment (DSE) is currently finalising the Victorian Strategy for Healthy Rivers, Estuaries and Wetlands (VSHREW). It is anticipated that this discussion paper (in particular the direction and recommendations) will align with the policy developments outlined in the VSHREW.

2. Vision / Objective

The vision for wetlands within the North Central CMA region has been informed by the vision developed in the Victorian Biodiversity Strategy (1997) (DNRE 1997):

'...to protect wetland biodiversity by promoting the conservation and wise use of all wetlands.'

DNRE (1997), wetlands section.

This vision and associated outcomes were also used to inform the vision and outcomes used in the Loddon Campaspe Irrigation Region Wetland Action Plan (North Central CMA 2010). These were adopted by the Steering Committee that oversaw the 2007 Wetland Action Plan (North Central CMA 2007 in North Central CMA 2010). It is proposed that these principle outcomes be used to inform the RCS:

- *'The maintenance and where possible, enhancement of existing wetland values*
- *The development of viable wild population of native wetland-dependent flora, fauna and ecological communities*
- *Strong partnerships between agencies and the community that promote protection of biodiversity values and sustainable use of wetlands within the wider landscape*
- *An understanding of wetland condition and the detection of change by ensuring data needs are fully understood and met*
- *An integrated approach to wetland management that considers catchment wide impacts*
- *An enhanced understanding of wetland values, threats and mitigation action.'*

North Central CMA (2010), pg. 5.

The goal for wetland management within the North Central CMA region developed in the Regional Catchment Strategy 2003 – 2007 was that:

'...wetlands will be managed to enhance their environmental function and, where appropriate, provide opportunities for economic, recreational and amenity use.'

North Central CMA (2003) pg. 86

It is proposed to use the following Vision for Wetlands in the RCS 2012-2018 "Wetlands will be managed to enhance their environmental function and, where appropriate, provide opportunities for economic, recreational and amenity use"

Do you agree with the Vision for the Asset Theme? Can you suggest how it could be improved modified and strengthened?

3. Asset description

A wetland is defined as “...any area of temporary or permanently waterlogged or inundated land, natural or artificial, with water that is standing or running, ranging from fresh to saline, and where inundation by water influences the biota and ecological processes occurring at any time.’ Boulton and Brock (1999) pg. 3

Wetlands in the North Central CMA region are important for a number of reasons. Wetlands support extensive food chains and rich biodiversity by providing a unique ecosystem within the landscape which can support a range of flora and fauna species (Mitsch and Gosselink 2007). They are the sources, sinks and transformers of a wide range of chemical, biological and genetic material (Mitsch and Gosselink 2007). They provide important ecological functions for rivers and floodplains through nutrient and sediment exchange, as well as the dispersal of organic matter and biota. At times they can stabilise water supplies, ameliorating the impacts of floods and drought. They can also clean water passing through them and recharge groundwater supplies (Mitsch and Gosselink 2007).

Wetlands provide social benefit to local communities as they are a focal point for recreation activities such as swimming, boating, picnicking and duck hunting in some cases. Figure 1 shows a community picnic at Lake Meran during the 1920s. As well as the social aspect that wetlands provide for active and passive recreational activities, they may also have economic benefit to local landholders.

Under current arrangements, some wetlands within the irrigation region provide water for irrigation, stock and domestic use via diversion licences. Other wetlands within the region provide important areas of fertile soils which may be cropped or grazed when the wetland is not holding water. These wetlands are primarily located on private land, and may benefit from targeted wetland management and protection.

Wetlands are also important for indigenous communities within the region. Aboriginal groups were known to have camped near wetlands where they were able to utilise wetland resources including game, plants and stone (Parks Victoria 2003). Figure 2 shows a scarred tree at Richardson’s Lagoon, west of Echuca. Kow Swamp in the north of the region is considered to hold the largest known single population of late Pleistocene humans in the world (Flood 1999 in Stone and Cupper 2003). This population occupied the wetland area between 22,000 and 19,000 years ago (Stone and Cupper 2003).



Figure 1. Lake Meran 1920s



Figure 2. Scarred tree at Richardson’s Lagoon.

Wetland mapping shows that there are 1,619 wetlands greater than one hectare in size within the North Central CMA region. A total of 84,325ha or 2.8% of the region is covered by these wetlands, and 77% of these wetlands are considered to be of regional, national or international importance including the Gunbower Forest Ramsar Site and the Kerang Wetlands Ramsar Site (North Central CMA 2007). Figure 3 shows the proportion of wetlands or wetland complexes within the North Central CMA region along with their listing. Figure 4 shows the mapped wetlands within the North Central CMA region.

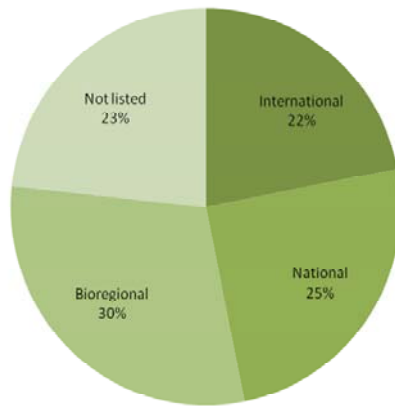


Figure 3. Wetland significance within the North Central CMA region

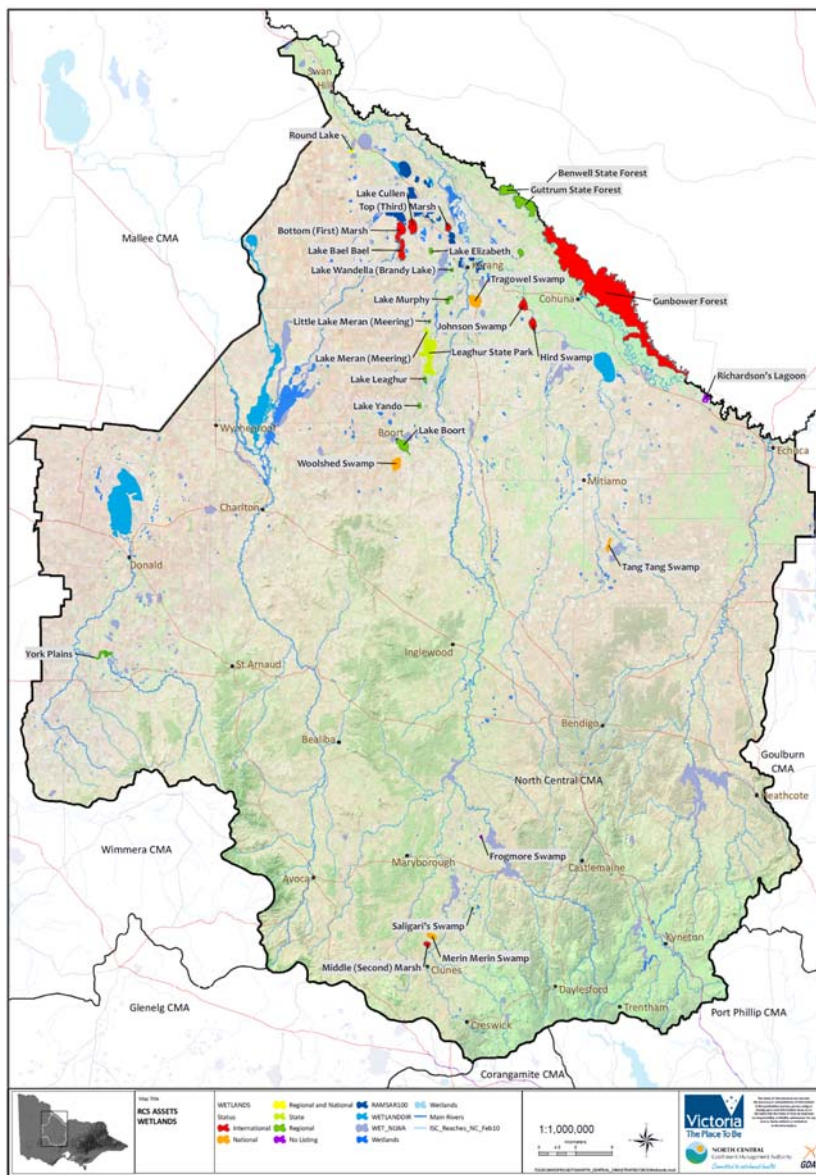


Figure 4. Mapped wetlands in the North Central CMA region

4. Condition of asset

Wetlands in Victoria are currently classified using a system developed by Corrick and Norman which includes information on water depth, water permanency and salinity (Corrick and Norman 1980 in DSE 2007). Wetlands in Victoria were mapped and classified between 1975 and 1994 and developed into spatial geographic information system (GIS) layers. These layers represent the wetland characteristics at the time of mapping (referred to as Wetlands 1994 layer), as well as an interpretation of the likely wetland characteristics prior to European settlement (referred to as Wetlands 1788 layers) (DNRE 2000a; DNRE 2000b).

These wetland datasets are currently the best available for wetlands within the North Central CMA region. There are however, some issues with the mapping, including the location on some wetlands, their size and their classification. During a project undertaken in 2008, it was found that:

'In some sections the existing Wetland 1994 layer fails to map wetlands which are mapped on the VicMap Waterbody layers; conversely in some sections VicMap Waterbody fails to map wetlands which are mapped on Wetland 1994.'

Alluvium, 2008 pg. 1

Further, *'There are sections where a wetland is likely to be present (field verification required to confirm) but neither VicMap Waterbody nor Wetland 1994 have mapped a wetland.'*

Alluvium, 2008 pg. 1

The issues with these wetland layers have been recognised at a state level, and a project is currently underway which aims to rectify some of the inconsistencies in mapping for the whole of Victoria. Until this updated mapping is available, the Wetlands 1994 and Wetlands 1788 layers will be used to inform wetland management within the North Central CMA region.

The main process contributing to wetland loss and degradation throughout Victoria has been total or partial drainage of wetlands, with the majority of these losses occurring on private land (DNRE 1997). Another mechanism which has impacted wetland condition through the region has been altered water regimes. This factor has accounted for a significant proportion of wetland change over time (DNRE 1997).

Between 1788 and 1994 there were significant changes to wetlands within the North Central CMA region. Table 1, Figure 5 and Figure 6 show the area of wetlands within the region, and the changes in wetland category that have occurred. The total area of wetlands within the North Central CMA region declined by almost 30,000ha between 1788 and 1994, with the largest change in wetland area occurring in freshwater meadows (declining by 34,391ha) and open freshwater (increasing by 14,248ha).

These changes have occurred for a number of reasons, including the following (North Central CMA 2010):

- Increases of permanent open freshwater wetlands due to the use of these wetlands within the irrigation supply system as storage basins or as outfall points from the irrigation system
- Increases in saline wetlands caused by rising groundwater levels and the requirement for salt disposal basins within the region and a lack of flushing with freshwater
- Declines in freshwater meadows due to the factors outlined above, as well as land clearing, grading and drainage.

In addition, overall changes to wetland distribution through the region has occurred as wetlands have been isolated from the floodplain and converted to agricultural land (North Central CMA 2010).

Table 1. Breakdown of wetlands within the North Central CMA region (public land, private land and overall).

Wetland category (Corrick and Norman)	Public land			Private land			Overall		
	1788 (ha)	1994 (ha)	Change in area (ha) (- / +)	1788 (ha)	1994 (ha)	Change in area (ha) (- / +)	1788 (ha)	1994 (ha)	Change in area (ha) (- / +)
Freshwater meadow	60,467	26,489	- 33,987	14,605	14,092	- 513	75,072	40,581	- 34,491
Shallow freshwater marsh	7,435	2,856	- 4,579	4,273	1,957	- 2,316	11,708	4,813	- 6,895
Deep freshwater marsh	2,249	545	- 1,704	8,279	4,336	-3,942	10,527	4,881	- 5,646
Permanent open freshwater	1,295	3,519	+ 2,223	12,830	24,855	+ 12,025	14,126	28,374	+ 14,248
Semi-permanent saline	501	1,205	+ 704	977	1,846	+ 869	1,478	3,051	+ 1,573
Permanent saline	1	184	+ 183	1,383	2,178	+ 795	1,384	2,362	+ 978
Other	3	243	+ 240	-	27	+ 27	3	270	+ 267
Total	71,950	35,040	- 36,910	42,347	49,292	+ 6,945	114,297	84,332	- 29,965

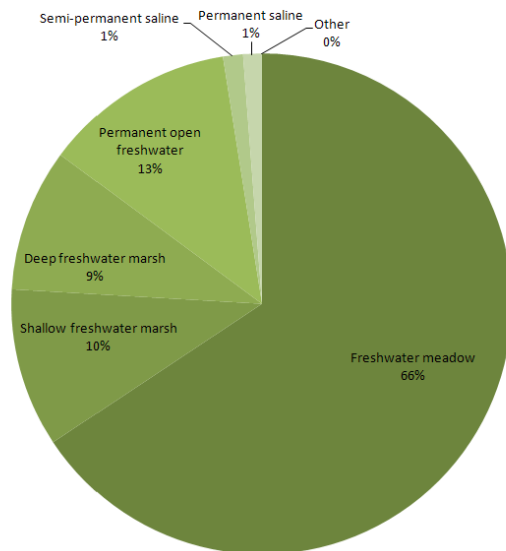


Figure 5. Wetlands in the North Central CMA region - 1788

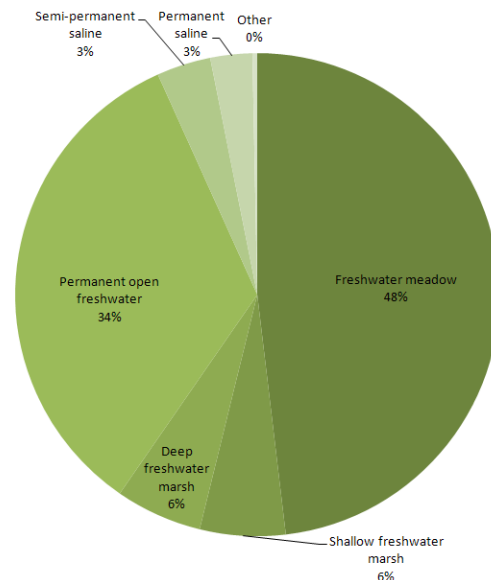


Figure 6. Wetlands in the North Central CMA region - 1994

Since the 1994 mapping was completed, it is likely that the total area of each wetland classes has changed further. In particular, it is likely that permanent open freshwater wetlands are no longer permanent wetlands due to changes in water management and the impacts of drought (North Central CMA 2010). It is expected that these wetlands will remain as intermittent wetlands into the foreseeable future which may be represented by any mapping of wetlands that occurs into the future (North Central CMA 2010).

The Index of Wetland Condition (IWC) methodology assesses wetland condition based on the *'biological, physical, and chemical components of the wetland ecosystem and their interactions'* (DSE 2005, pg. i). One of the IWC aims is to provide a method to monitor wetland extent and condition over a 10-20 year timeframe, with the benchmark condition considered to be the wetland unmodified by human impact associated with European settlement (DSE 2005).

A number of wetlands within the North Central CMA region received their first condition assessments using the IWC methodology during 2009 and 2010. Seventy-seven wetlands were assessed for characteristics including wetland catchment, physical form, hydrology, water properties, soils and

biota. Seven wetlands were considered to be in excellent condition, 25 in good condition, 38 in moderate condition and seven were in poor condition (Figure 7).

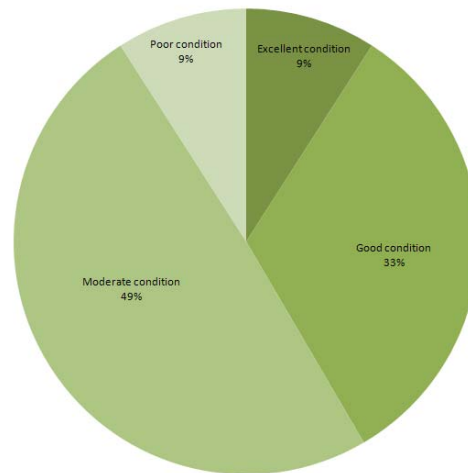


Figure 7. Breakdown of wetlands assessed in the North Central CMA region using the IWC methodology (a total of 77 wetlands were assessed during 2009-10).

The wetlands assessed in this process to date are only a limited sample of wetlands within the North Central CMA region. They were assessed during a very dry period within northern Victoria which likely resulted in low scores for factors such as wetland biota. It is recommended that these, and other wetlands within the region continue to be assessed during the RCS period to understand wetland condition during (and after) a wet period for the wetlands.

Environmental Water

Whilst not a direct asset, environmental water is a key tool in maintaining the health of wetlands in the region. The North Central CMA is the appointed Environmental Water Reserve Manager within the North Central region and works with the Victorian Environmental Water Holder (VEWH) and the Commonwealth Environmental Water Holder (CEWH) and a range of other parties to maximise environmental benefits from the EWR and integrate it with other waterway and wetland management activities (see Appendix 1).

5. Threats to asset

There are a number of threats or threatening processes that can impact the environmental, social and/or economic condition of wetlands within the North Central CMA region. These threats can differ on a spatial and/or temporal scale so all threats identified do not necessarily impact on all wetlands within the region. Specific threats to wetland assets will be explored in assessments for priority assets which will be undertaken using the Investment Framework for Environmental Resources (INFFER).

The aquatic value identification and risk assessment (AVIRA) process (DSE 2009) and North Central CMA (2007) identify the following general wetland threats (Table 2):

Table 2. Wetland threats

Threat	Explanation of threat and impact on wetland
Altered hydrology / changed water regime ^{1,2}	<ul style="list-style-type: none"> • Prior to river regulation and floodplain modifications, wetlands would have primarily flooded in late winter and spring from floodplain inundation. Extensive flooding no longer occurs due to river regulation, water diversion, levees and infrastructure impediments (e.g. irrigation channels). • Changes to the ecology of wetlands can occur as a result of using wetlands as water storage areas within the irrigation distribution network. This impact wetland flora a fauna species that rely on a dry phase of the wetland to complete their lifecycles. • Shallow ephemeral wetlands (freshwater meadows and marshes in particular) can be impacted by draining to provide agricultural land.
Decreased structural variety ¹	<ul style="list-style-type: none"> • The presence of native vegetation within wetlands is an important component of the ecological value they provide. Removal of woody debris (e.g. fallen or standing timber) reduces the structural habitat for fauna species during wet and dry times.
Soil disturbance ²	<ul style="list-style-type: none"> • Soils are important in the functioning of wetlands as they provide a physical substrate for aquatic plants, and habitat for benthic invertebrates and micro-organisms. • Activities such as pugging by livestock and invasive animals, human trampling, driving of vehicles in wetlands and carp muddling can all cause soil disturbance which can reduce water holding capacity, have negative impacts on the flora and fauna of the wetland and increase turbidity.
Loss of wetland through landforming / reduced wetland area / altered wetland form ^{1,2}	<ul style="list-style-type: none"> • Wetland area and bathymetry are critical components of wetland physical form. These can be altered by reductions in wetland area and alterations in wetland form (through excavation, land forming or sedimentation). • Land forming has been particularly prevalent in irrigation areas to promote the efficient use of irrigation water and minimising water ponding. This practice can destroy shallow ephemeral wetlands such as freshwater meadows.
Habitat fragmentation / reduced wetland connectivity ^{1,2}	<ul style="list-style-type: none"> • Native vegetation clearing and isolation of wetlands from the floodplain through the North Central CMA region has resulted in pockets of habitats that are no longer connected to each other. • Fragmentation can reduce diversity of species and genetics in an area as flora and fauna species can no longer access or move between required habitat type/s of sufficient area.
Salinity ^{1,2}	<ul style="list-style-type: none"> • Water with elevated salt concentrations has the potential to severely degrade wetlands. In general freshwater biota cannot adapt to saline water and recruitment within species can be impacted. • Some wetlands within the North Central CMA region may be adversely affected by increasing salinity levels if they receive water that is high in salt, or receive an intrusion of saline groundwater. • In wetlands where salt is naturally occurring, reduced flushing of wetlands can lead to an accumulation of salt within the wetland, leading to increased concentrations when the wetland is flooded next. s can lead to an accumulation of salt within the wetland, leading to increased concentrations when the wetland is re-flooded.
Nutrients ^{1,2}	<ul style="list-style-type: none"> • Eutrophication (excessive phytoplankton/algal growth) can occur as a result of excessive nutrient loads from sources including agricultural runoff and sewage disposal. Toxic forms of blue-green algae can cause harm to animals (including humans).
Invasive flora and fauna ^{1,2}	<ul style="list-style-type: none"> • Invasive plants and animals (IPA) are considered to be a major cause of degradation to wetland assets within the region (North Central CMA 2011 – IPA). • These species threaten biodiversity by competing for natural resources and the loss of habitat for native species (IPA). They can also displace native species and provide harbour for invasive animals (IPA). • Invasive species may feed on or out-compete native plants and animals. They may also be toxic to native animals if injected.
Cont.	
Resource	<p><i>Grazing</i></p> <ul style="list-style-type: none"> • Wetlands which periodically dry are often used for grazing sheep or cattle. This can occur on both private and public land and may cause detrimental harm to the wetland

Threat	Explanation of threat and impact on wetland
utilisation ¹	<p>depending on the grazing regime provided (timing, stocking rate, frequency etc).</p> <ul style="list-style-type: none"> In some cases grazing may benefit the wetland area by controlling the proliferation of weeds, however excessive grazing can prevent regeneration of wetland plants and may cause damage to soil structure through pugging. <p><i>Recreation</i></p> <ul style="list-style-type: none"> Wetlands within the North Central CMA region provide an important component of the recreation and tourism industry. They provide areas for activities such as fishing, camping, boating, swimming and duck hunting. Some recreational activities are known to have a greater impact on the ecology of wetlands than others. Those activities which may have a high impact on the wetland include camping (large groups), trail bike riding, jet skiing, power boating and water skiing. Activities with lower impacts include bush camping, canoeing and kayaking, non-powered boating, bush walking, swimming and picnicking. <p><i>Other activities</i></p> <ul style="list-style-type: none"> Forestry operations can impact wetlands within the North Central CMA region by decreasing structural habitat. Timber production is conducted under the <i>Code of Forest Practices for Timber Production</i> and the <i>Flora and Fauna Guarantee Act 1988</i>. If these codes are adhered to, it is expected that only minimal disturbance to environmental values would be observed. Mining activities can also occur in some wetlands within the region. Gypsum mining occurs in the north of the region, and may impact on wetlands.
Regional changes ¹	<ul style="list-style-type: none"> The likelihood of climate change impacting wetland flooding frequency within the North Central CMA region is considered high (Heron and Joyce 2008). It is anticipated that there will be large scale changes to watering regimes of many wetlands within the region, which will impact existing values for native flora and fauna that the wetlands provide (Heron and Joyce 2008). In addition to climate change impacts within the region, impacts to wetlands may occur through landuse changes within the region. For wetlands within the irrigation region, the changes in water rights (particularly trading of these out of the region) may threaten the long-term viability of providing environmental water to certain wetlands. Reconfiguration of irrigation systems within irrigation areas of the North Central CMA region can result in a decrease of irrigation infrastructure and generate water savings (North Central CMA 2011). The impact of these processes on wetlands can occur when there is a change to water delivery mechanisms and/or outfall water.
Lack of information ¹	<ul style="list-style-type: none"> The majority of work undertaken in relation to wetland management within the region has been conducted in the Kerang Wetlands Ramsar Site and Gunbower Forest Ramsar Site. Other wetlands within the irrigation area of the North Central CMA region have also been the recipients of studies and investigations, with wetlands within the Bort Wetland Complex receiving the next highest level of investment in understanding. The large number of wetlands within the region, along with the scattered distribution and lack of resourcing towards their management has meant that there is little, if any information on a majority of wetlands within the region.
<p>¹ Identified in North Central CMA 2007 ² Identified in DSE 2009</p>	

Do you feel the asset, its condition and risks have been described appropriately in the context of RCS development?

6. Community context

Wetland projects and activities undertaken by the North Central CMA have community input. The Natural Resource Management Committee (NRMC) is a community based committee that provides North Central CMA with a local community perspective on planning and works, and advises the North Central CMA Board on regional strategy, investment priorities and community engagement. Projects may be further supported by portfolio representatives from the NRMC and steering committees including community and agency members. Wetland projects also deliver a range of community engagement activities such as community events, fact sheets and media activities.

7. Priority setting

There have been a number of processes undertaken over recent years to determine the relative priorities of wetland assets, and principles for management within the North Central CMA region (e.g. North Central CMA 2007; North Central CMA 2005).

The Draft Wetland Strategy (North Central CMA 2007) defines a number of principles for wetland management in the North Central CMA region. While these principles do identify specific wetlands priorities, it is important to recognise that the prioritisation process undertaken to determine wetlands for detailed assessment will align with the principles defined in North Central CMA (2007):

- Protect and enhance wetlands listed on the Ramsar, Directory of Important Wetlands or Bioregionally Significant register.
- Protect wetland sites of significance as listed on the Register of the National Estate.
- Protect and enhance wetlands connected to High Value and Representative River Reaches (as defined in the River Health Strategy).
- Protect wetlands with a high environmental value.
- Protect wetland with a high social value.
- Protect wetlands with a high economic value.

The process defined below aims to prioritise assets for further investigation and detailed assessment (i.e. development of an INFFER assessment). The priority setting process does not aim to define specific wetlands for investment at this stage.

The information used in this prioritisation process is generated from a number of sources. Information generated at the Asset Identification workshops held during 2009 as part of the RCS development was used to inform the asset list, the level of significance of the asset, as well as the level of threat. Where there was a notable wetland asset missing from the list, it has also been included. The status of each wetland has been informed by the listing of wetlands in relevant legislation or documentation. The feasibility rating has been informed by current knowledge of each wetland, however this rating should be updated if any new information about the technical and/or social feasibility of a wetland project.

These ratings have been combined to inform the level of priority for detailed assessment to be undertaken using the Asset-Based Approach to Priority Setting.

Table 3 shows wetlands in the North Central CMA region which are considered significant, are threatened and have a medium-high level of feasibility. These wetlands are considered priority wetlands detailed assessment within the North Central CMA region.

Note: The right hand column shows the relevant wetland complex that each prioritised wetland is in. It is proposed that the wetland complexes be used for detailed assessment, rather than individual wetlands. Figure 8 shows the locations of priority wetlands identified for detailed assessment within the North Central CMA area.

Appendix 2 shows the full list of wetland assets identified in the North Central CMA region. Any of the wetlands included in this list may become priorities for detailed assessment during the RCS development process.

Table 3. Filtering results used to determine priorities for detailed assessment, informed by asset identification process, level of significance, level of threat and feasibility

Wetland	Status (relevant listing) ¹	Significance (asset identification) ²	Threat ³	Feasibility (Technical-Social) ⁴	Priority for detailed assessment	Wetland Complex
Gunbower Forest	International	Very High	Moderate	Medium-High	High	Gunbower Forest Ramsar Site ⁶
Top (Third) Marsh	International	Very High	High	Medium-High	High	Kerang Ramsar Wetland Site ⁶
Middle (Second) Marsh	International	Very High	High	Medium-High	High	
Bottom (First) Marsh	International	Very High	High	Medium-High	High	
Lake Bael Bael	International	Very High	High	Medium-High	High	
Lake Cullen	International	Very High	Moderate	Medium-High	High	
Johnson Swamp	International	High	Low (Moderate-High)	Medium-High	Medium	
Hird Swamp	International	Very High	Low (Moderate)	Medium-High	Medium	
Tragowel Swamp	National	Very High	High	Medium-Low	Medium	Central Murray Wetlands ⁶
Lake Wandella (Brandy Lake)	Regional	Medium	High	Medium-Medium	Medium	
Lake Murphy	Regional	High	Low	Medium-High	Medium	
McDonalds Swamp	Regional	Very High	Low	Medium-High	Medium	
Lake Elizabeth	Regional	High	Low (Moderate)	Medium-Medium	Medium	
Richardson's Lagoon	-	Very High	Low	Medium-High	Medium	
Guttrum State Forest	Regional	High	Moderate	Medium-Medium	Medium	
Benwell State Forest	Regional	High	Moderate	Medium-Medium	Medium	
Round Lake	National (due to Hardyhead presence) Regional	Very High	High	Medium-Medium	Medium	
Woolshed Swamp	National	High	Moderate	Medium-Medium	Medium	Mid Loddon Wetlands ⁷
Lake Boort	Regional	Very High	Moderate	Medium-Medium	Medium	
Lake Yando	Regional	Very High	Moderate	Medium-Medium	Medium	
Lake Leaghur	Regional	High	Moderate	Medium-Medium	Medium	
Leaghur State Park	State	Very High	Moderate	Medium-Medium	Medium	
Lake Meran (Meering)	Regional	Very High	Moderate	Medium-Medium	Medium	
Little Lake Meran (Meering)	Regional	Medium	Moderate	Medium-Medium	Medium	

Wetland	Status (relevant listing) ¹	Significance (asset identification) ²	Threat ³	Feasibility (Technical-Social) ⁴	Priority for detailed assessment	Wetland Complex
York Plains	Regional	High	Moderate	Medium-Medium	Medium	York Plains ⁸ Wetlands
Merin Merin Swamp	National	Very High	Moderate	Medium-Medium	Medium	Moolort Plains Wetlands ⁸
Middle Swamp	Regional	Very High	Moderate	Medium-Medium	Medium	
Saligari's Swamp	Regional	High	Moderate	Medium-Medium	Medium	
Frogmore Swamp	-	High	Moderate	Medium-Medium	Medium	
Tang Tang Swamp	National	Very High	Moderate	Medium-Medium	Medium	Kamarooka Wetland Complex ⁷

¹Internationally significant wetlands are those listed under the Ramsar convention.

Nationally significant wetlands are those identified in A Directory of Important Wetlands in Australia (Australian Nature Conservation Agency 1996).

Regionally significant wetlands were identified in the National Land and Water Resources Audit (National Heritage Trust 1997-2002).

²Level of significance informed by RCS asset identification process.

³Level of threat informed by RCS asset identification process.

⁴Feasibility is considered in terms of technical feasibility and social feasibility. Technical feasibility is defined as the following:

If appropriate works and actions were implemented, to what extent could the degradation identified in criterion 2.1 be reduced? (high, medium, low). High implies a reduction of more than 50% in degradation, medium implies 25-50% reduction and low means less than 25% reduction.

Social feasibility is defined as the following:

If a project for the asset is funded, what is the likely extent of implementation of the works and actions needed to protect or enhance the asset? (high, medium, low). High means that most or all of the required works would be implemented, medium means that around half of them would be implemented, and low means that a quarter or less would be implemented.

⁵Rating informed by RCS Asset Based Approach to Priority Setting – Advisory Note.

⁶INFFER assessment completed for part of asset area – update required.

⁷INFFER assessment yet to be completed for asset area – assessment required.

⁸INFFER assessment completed for full asset area – no additional assessment required.

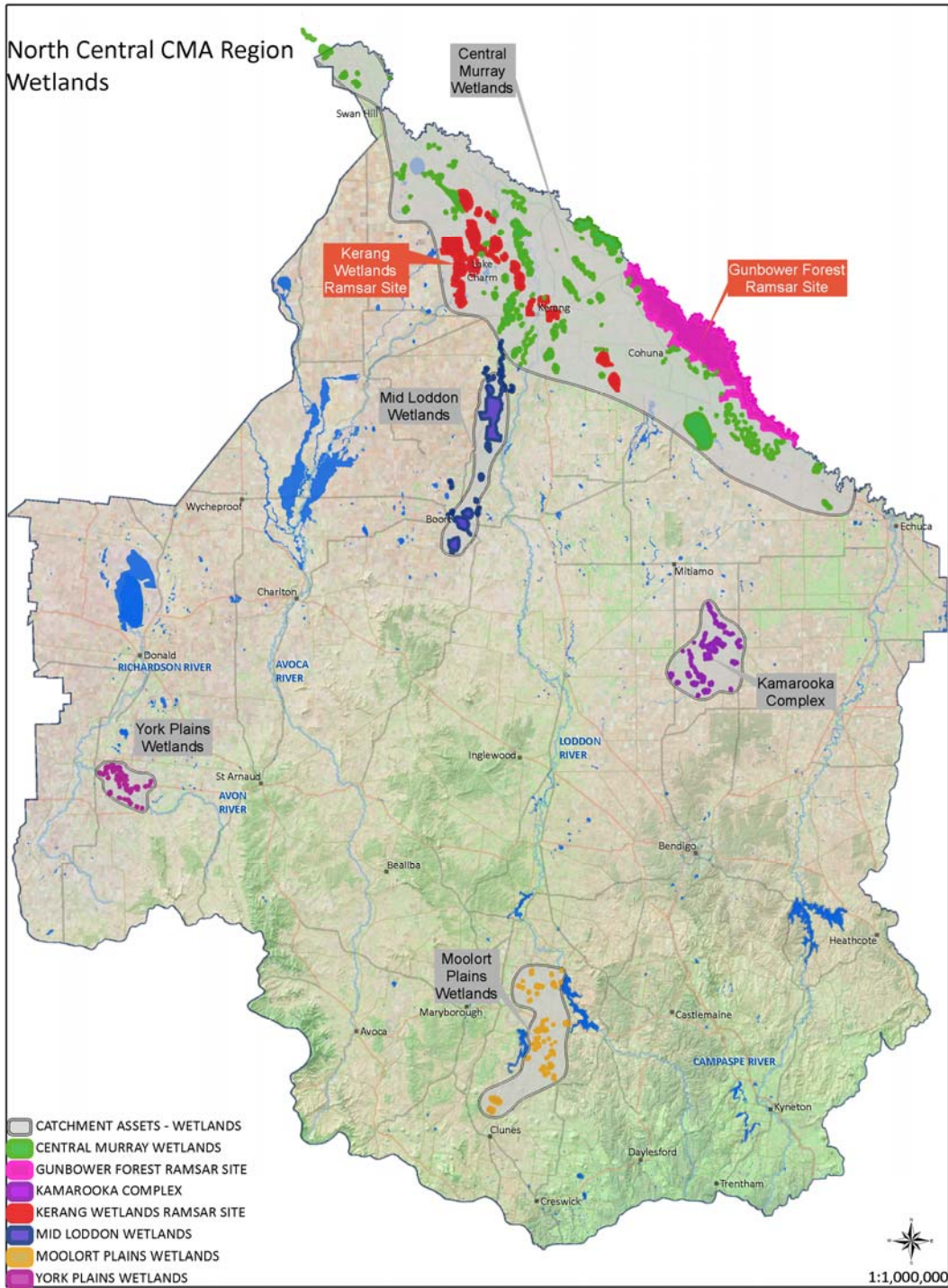


Figure 8. Priority wetlands identified for detailed assessment

Do you agree with the priorities identified? Are there additional priorities, if so what are they and why should they be a priority?

8. Priority asset objectives

To date, five wetland assets have had specific targets developed through relevant INFFER assessments. These objectives are considered to be specific, measurable, attainable, relevant and time-bound (SMART) and are provided in Table 4.

Table 4. SMART objectives for priority assets

Asset	SMART objective
Gunbower Forest Ramsar Site	<p><i>Values – International recognised Red Gum/Box Wetland System home to significant colonial bird breeding events</i></p> <p><i>Threats – Altered flow regimes, weeds</i></p> <ul style="list-style-type: none"> • <i>Aspirational goal: The overall goal is to maintain and improve the ecological character of the Gunbower Ramsar Wetlands as a key breeding site for migratory birds.</i> • <i>SMART goal 1: By 2025 80% of permanent and semi permanent wetlands within Gunbower forest are in healthy conditions.</i> • <i>SMART goal 2: Successful breeding of thousands of colonial waterbirds, of a range of species including egrets, cormorants and herons, at least three years in 10.</i> <p><i>Actions – Infrastructure works and measures, environmental flow management, weed control</i></p>
Avoca Marshes	<p><i>Values – Part of Kerang Lakes Ramsar site (International recognised) Box Wetland System.</i></p> <p><i>Threats – Pest plant and animals</i></p> <ul style="list-style-type: none"> • <i>The overall goal of this project is to increase the ecological condition of the Avoca Marshes by 2025 as measure by Index of Wetland Condition.</i> • <i>SMART goal: Increase the extent of River Red-gum dominated EVCs by 10% on the bed/fringes of Second and Third Marsh through establishing regeneration by 2025.</i> <p><i>Actions – Pest Plant and Animal control</i></p>
Central Murray Wetlands: Hird Swamp, Johnson Swamp, Lake Murphy, McDonalds Swamp, Richardson’s Lagoon, Lake Elizabeth, Round Lake and Lake Cullen	<p><i>Values – Highly depleted wetland types across the region that support significant threatened flora and fauna species</i></p> <p><i>Threats – Pest plant and animals, altered flow regimes, salinity</i></p> <ul style="list-style-type: none"> • <i>The overall goal of this project is to maintain and improve the ecological condition of eight wetlands within the central Murray floodplain.</i> • <i>Specifically, the following will be achieved:</i> <ul style="list-style-type: none"> ○ <i>provision of a range of habitat types at Hirds Swamp, Johnson's Swamp, Lake Murphy, McDonalds Swamp and Richardson's Lagoon typical of Deep Freshwater Marshes. This will include areas of open water, lignum and emergent aquatic vegetation.</i> ○ <i>improvement and maintenance of extent and condition of riparian vegetation (specifically Black Box community) at Lake Elizabeth and Lake Cullen.</i> <p><i>Actions – Environmental flow management, fencing, pest plant and Actions : animal control, structural works</i></p>

Mid Loddon Wetlands	<p><i>Values – Regionally valued wetland complexes that support significant threatened flora and fauna species</i></p> <p><i>Threats – Pest plant and animals, altered flow regimes, salinity</i></p> <ul style="list-style-type: none"> • <i>Aspirational goal: The overall goal is to maintain and improve the condition of the Mid Loddon Wetlands by 2050 as measured by the Index of Wetland Condition.</i> • <i>SMART goal 1: Maintain the current extent and restore health and distribution of rare/vulnerable/threatened terrestrial EVCs by 2025</i> <p><i>SMART goal 2: Maintain extent and restore health of aquatic emergent and amphibious habitats by 2025.</i></p> <p><i>Actions – environmental flow management, fencing, pest plant and animal control, structural works</i></p>
York Plains Wetlands	<p><i>Values – Highly valued wetland complex on private land within the Avon-Richardson Catchment</i></p> <p><i>Threats – Cropping, pest plant and animals</i></p> <ul style="list-style-type: none"> • <i>Aspirational goal: Improve the condition of the York Plains wetlands to good by 2050 as measured by Index of Wetland Condition.</i> • <i>To increase the extent of native vegetation by from 700 ha to 1000 ha by 2015.</i> • <i>To increase the average habitat hectare score of remnant vegetation patches across the asset area by 10% by 2014.</i> • <i>To lower the watertable to a depth of greater than 2 m (except for gross seasonal fluctuations in excessively wet years) over the capture zone (8,400 ha within and immediately surrounding the York Plains, as assessed by CAT modelling) by 2019.</i> <p><i>Actions – fencing, pest plant and animal control, covenants</i></p>
Moolort Wetlands	<p><i>Values – Unique wetland complex situated within the volcanic plains.</i></p> <p><i>Threats – Cropping, pest plant and animals</i></p> <p><i>Improve the condition of the Moolort Plains wetlands by 2050 as measured by Index of Wetland Condition.”</i></p> <ul style="list-style-type: none"> • <i>To increase the extent of native vegetation surrounding the swamps on private land by 150 ha from 1034 ha to 1184 ha by 2015.</i> • <i>To improve the condition of native vegetation in and around the swamps on private land by 10% by 2015 (as measured by appropriate habitat assessment metric).</i>
Gunbower Forest Ramsar Site	<p><i>Values – International recognised Red Gum/Box Wetland System home to significant colonial bird breeding events</i></p> <p><i>Threats – Altered flow regimes, weeds</i></p> <ul style="list-style-type: none"> • <i>Aspirational goal: The overall goal is to maintain and improve the ecological character of the Gunbower Ramsar Wetlands as a key breeding site for migratory birds.</i>

	<ul style="list-style-type: none"> • <i>SMART goal 1: By 2025 80% of permanent and semi permanent wetlands within Gunbower forest are in healthy conditions.</i> • <i>SMART goal 2: Successful breeding of thousands of colonial waterbirds, of a range of species including egrets, cormorants and herons, at least three years in 10.</i> <p><i>Actions – Infrastructure works and measures, environmental flow management, weed control</i></p>
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9. Gaps in knowledge

There are a number of knowledge gaps in relation to wetland assets within the North Central CMA region. Specifically, the follow pieces of information could be used to inform further understanding of wetlands and future investment in wetlands in the region:

- Need for updated mapping of wetlands in the region (including review of classifications and/or listings).
- Understanding of current condition of wetlands – continue to undertake Index of Wetland Condition (IWC) assessments for wetland within the North Central CMA region.
- Undertake EVC mapping. It is recognised that EVC mapping has not been undertaken for a number of wetlands within the region. This is particularly the case for specific wetland EVC mapping.
- Addressing of significant knowledge gap in relation to wetlands on private land within the region. It is recommended that mapping and condition assessment of these private wetlands be undertaken.
- Continuation of monitoring activities to better understand ecological response to environmental water management within those wetlands that receive environmental water.
- Improving our understanding of floodplain behaviour and land ownership at key areas downstream of wetlands which are managed with environmental water. There is an identified potential risk of flooding private land unintentionally if wetlands holding environmental water spill. To further understand the level of this risk, investigations need to be undertaken.

Have the knowledge gaps been identified? If not what additional gaps in knowledge should be described?

10. Actions / planning required

Management of wetland assets into the future will be informed by a number of projects within the North Central CMA region, as well as projects within the state and the Murray-Darling Basin.

The following projects will directly inform our understanding and management of wetland assets within the region:

- Victorian Strategy for Healthy Rivers, Estuaries and Wetlands (statewide).
- Regional Strategy for Health Rivers and Wetlands (regional).
- Murray-Darling Basin Plan (basin focused).
- Aquatic Value Identification and Risk Assessment (statewide tool with regional information).

In addition to these projects, the following activities are recommended to be completed as part of the RCS:

- Complete Index of Wetland Condition (IWC) assessments for all priority wetlands.
- Develop/finalise INFFER assessments for all priority wetland assets identified in this paper.
- Undertake EVC mapping at priority wetland assets.
- Develop an understanding and undertake protection of wetlands on private land.
- Address the threats identified in relevant documents (e.g. wetland action plans).
- Work with landholders and land managers to protect wetlands.
- Coordinate Project identification and delivery with other groups within, and external to the North Central CMA.

Have regional issues/actions been identified appropriately? If not what additional regional scale issues/actions should be identified?

11. RCS direction and recommendations

It is recommended that the following wetland management principles be adopted to inform the RCS (informed by DNRE 1997 and North Central CMA 2010:

- Protect and enhance wetlands listed on the Ramsar, Directory of Important Wetlands or Bioregionally Significant register.
- Protect wetland sites of significance as listed on the Register of the National Estate.
- Protect and enhance wetlands connected to High Value and Representative River Reaches (as defined in the River Health Strategy).
- Protect wetlands with a high environmental value.
- Protect wetland with a high social value.
- Protect wetlands with a high economic value.

In order to achieve these principles, there are a number of activities that need to be undertaken, namely the tasks identified in Section 10: Actions / planning required.

Do you agree with the overall RCS directions and recommendations? If not what additional directions and recommendations should be included?

What part could your organisation play in meeting the directions and recommendations set out in this discussion paper and subsequently in the RCS?

Overall, do you have any additional comments or issues you would like to raise in regards to this discussion Paper?

12. References

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13. Appendix 1 – Summary of Environment Flow Management

Environmental flows

Water is the lifeblood of our rivers and a healthy river requires a variety of flows. An "environmental flow" is any managed change in a river's flow pattern intended to maintain or improve river health. The range of flows required to maintain river health constitute a flow regime, where the volume, time of year, and duration of delivered flows vary. These individual flow components provide differing benefits to the river, and when in combination are delivered as a flow regime they contribute to maintaining or improving the health of the river.

The Environmental Water Reserve (EWR) is the legal term used to describe the amount of water set aside to meet environmental objectives. The EWR was established in 2005 as an outcome of the 'White Paper – Securing our water future together'. Changes in the legislation gave protection for the first time to the environment's share of water in rivers and wetlands.

The EWR water includes:

- Environmental water entitlements which are water held in storage that is managed to provide environmental flows in rivers
- Environmental water that must be released by water corporations from their entitlements, usually called passing flows
- Unregulated flows and spills from storages due to rainfall

Established on 1 July 2011 after amendments to the Water Act, the Victorian Environmental Water Holder (VEWH) is an independent authority that holds Victoria's environmental water entitlements. Its role is to coordinate delivery of environmental water across the state independently from the Victorian Government.

The North Central CMA is the appointed Environmental Water Reserve Manager within the North Central region. Our role is to work with the Victorian Environmental Water Holder, other environmental water holders, storage operators, water corporations, the community and land-holders to maximise environmental benefits from the EWR and integrate it with other waterway management activities. This includes:

- Environmental water planning
- Community engagement
- Bidding for environmental water
- Managing environmental water releases
- Monitoring and reporting

Rivers within the North Central CMA may also be allocated water from other sources including the Murray Darling Basin Authority the Living Murray Program, Commonwealth Environmental Water Holder, water donations and alternative delivery of consumptive water

14. Appendix 2 - Identified wetland assets within the North Central CMA region.

Wetland	Status (listing) ¹	Significance (asset filtering) ²	Threat ³	Feasibility (Technical-Social) ⁴	Priority for detailed assessment ⁵
Lake Tutchewop	International	High	Moderate	Low-Low	Low
Lake William	International	High	Moderate	Low-Low	Low
Lake Kelly	International	High	Moderate	Low-Low	Low
Little Lake Kelly	International	High	Moderate	Low-Low	Low
Kangaroo Lake	International	Medium	Low	Low-Low	Low
Racecourse Lake	International	Medium	Low	Low-Low	Low
Lake Charm	International	Medium	Low	Low-Low	Low
Little Lake Charm	International	High	Low	Low-Low	Low
Top (Third) Marsh	International	Very High	High	Medium-High	High
Middle (Second) Marsh	International	Very High	High	Medium-High	High
Bottom (First) Marsh	International	Very High	High	Medium-High	High
Lake Bael Bael	International	Very High	High	Medium-High	High
Lake Cullen	International	Very High	Moderate	Medium-High	High
Stevenson Swamp	International	Medium	-	Low-Low	Low
Third Lake	International	High	Low	Low-Low	Low
Middle Lake	International	Very High	Low	Low-Low	Low
Reedy Lake	International	Very High	Low	Low-Low	Low
Back Swamp	International	Medium	-	Low-Low	Low
Town Swamp	International	Medium	-	Low-Low	Low
Cemetery Swamp	International	Medium	-	Low-Low	Low
Fosters Swamp	International	Medium	-	Low-Low	Low
Johnson Swamp	International	High	Low	Medium-High	Medium
Hird Swamp	International	Very High	Low	Medium-High	Medium
Gunbower Forest	International	Very High		Medium-High	High
Tragowel Swamp	National	Very High	High	Medium-Low	Medium
Lake Wandella (Brandy Lake)	Regional	Medium	High	Medium-Medium	Medium
Wandella Forest	-	Very High	Moderate	Low-Low	Low
Two Mile Swamp	Regional	High	High	Low-Low	Low
Lake Murphy	Regional	High	Low	Medium-High	Medium
McDonalds Swamp	Regional	Very High	Low	Medium-High	Medium
Dry Lake	Regional	Low	-	Low-Low	Low
Lake Mannaor	Regional	Medium	-	Low-Low	Low
Lake Elizabeth	Regional	High	Low	Medium-Medium	Medium
Lake Boga	Regional	Medium	Low	Low-Low	Low
Kow Swamp	National	High	Low	Low-Low	Low
Richardson's Lagoon	-	Very High	Low	Medium-High	Medium
Murphy's Swamp	Regional	Low	Low	Low-Medium	Low
Guttrum State Forest	Regional	High	Moderate	Medium-Medium	Medium
Benwell State Forest	Regional	High	Moderate	Medium-Medium	Medium
Round Lake	National (due to Hardyhead presence)	Very High	High	Medium-Medium	Medium
	Regional				
Long Lake	Regional	Medium	Moderate	Medium-Low	Low
Golf Course Lake	-	High	Moderate	Low-Medium	Low
Woolshed Swamp	National	Very High	Moderate	Medium-Medium	Medium
Lake Boort	Regional	Very High	Moderate	Medium-Medium	Medium
Little Lake Boort	Regional	Very High	Moderate	Medium-Low	Low
Lake Lyndger	Regional	High	Moderate	Medium-Low	Low
Lake Yando	Regional	Very High	Moderate	Medium-Medium	Medium
Lake Leaghur	Regional	High	Moderate	Medium-Medium	Medium
Leaghur State Park	State	Very High	Moderate	Medium-Medium	Medium

Wetland	Status (listing) ¹	Significance (asset filtering) ²	Threat ³	Feasibility (Technical-Social) ⁴	Priority for detailed assessment ⁵
Lake Meran (Meering)	Regional	Very High	Moderate	Medium-Medium	Medium
Little Lake Meran (Meering)	Regional	Medium	Moderate	Medium-Medium	Medium
Round Lake	Regional	Medium	Moderate	Medium-Low	Low
Lake Batyo-Catyo	Regional	Medium	Moderate	Medium-Low	Low
Hollands Lake	Regional	Medium	Moderate	Medium-Low	Low
Cope-Cope Lakes	-	Medium	Moderate	Medium-Low	Low
Lake Buloke	National	High	Moderate	Medium-Low	Low
York Plains	Regional	High	Moderate	Medium-Medium	Medium
Merin Merin Swamp	National	Very High	Moderate	Medium-Medium	Medium
Middle Swamp	Regional	Very High	Moderate	Medium-Medium	Medium
Saligari's Swamp	Regional	High	Moderate	Medium-Medium	Medium
Frogmore Swamp	-	High	Moderate	Medium-Medium	Medium
Lake Lalbert	National	Very High	Moderate	Low-Medium	Low
Bunguluke Wetlands	National	High	Moderate	Low-Medium	Low
Tang Tang Swamp	National	Very High	Moderate	Medium-Medium	Medium
Thunder Swamp	Regional	High	Moderate	Low-Medium	Low
Lake Marmal	Regional	High	Moderate	???	???
Wooroonook Lakes	Regional	High	Moderate	???	???
Bradshaw Swamp	Regional	Moderate	Moderate	???	???
Lake Lookout	Regional	-	-	???	???
Sandhill Lake	Regional	-	-	???	???
Yassom Swamp	Regional	-	-	???	???
Griffiths Lagoon	-	High	Low	???	???
Dartagook Forest	-	High	Moderate	???	???
Bendigo Creek Floodplain and Wetlands	-	Moderate	Moderate	???	???
Carey Swamp	-	Moderate	Moderate	???	???
Malmsbury Wetlands	-	Moderate	Moderate	???	???
Pollock's Swamp	-	Moderate	Moderate	???	???
Powlett Swamp complex	-	Moderate	Moderate	???	???
Bartlett Swamp	Regional	-	-	???	???
Benjeroop State Forest	State	-	-	???	???
Govetts Swamp	Regional	-	-	???	???
Red Gum Swamp off Elmore-Mitiamo Rd, Milloo	-	Moderate	Moderate	???	???
Mt Alexander Wetlands	-	Moderate	Moderate	???	???
Crane's Lake	-	Moderate	Low	???	???
Little Swamp	-	Moderate	Low	???	???

¹Internationally significant wetlands are those listed under the Ramsar convention.

Nationally significant wetlands are those identified in A Directory of Important Wetlands in Australia (REFERENCE).

Regionally significant wetlands were identified in the National Land and Water Resources Audit (National Heritage Trust 1997-2002).

²Level of significance informed by RCS asset identification process.

³Level of threat informed by RCS asset identification process.

⁴Feasibility is considered in terms of technical feasibility and social feasibility. Technical feasibility is defined as the following: *If appropriate works and actions were implemented, to what extent could the degradation identified in criterion 2.1 be reduced? (high, medium, low). High implies a reduction of more than 50% in degradation, medium implies 25-50% reduction and low means less than 25% reduction.*

Social feasibility is defined as the following:

If a project for the asset is funded, what is the likely extent of implementation of the works and actions needed to protect or enhance the asset? (high, medium, low). High means that most or all of the required works would be implemented, medium means that around half of them would be implemented, and low means that a quarter or less would be implemented.

⁵Rating informed by RCS Asset Based Approach to Priority Setting – Advisory Note.