CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

Corangamite Wetland Strategy 2006 - 2011

Report Number: CWS 001
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FOREWORD:

The Corangamite Catchment Management Authority region has a diverse array of environmental features. Above all, it is distinguished by its lakes and wetlands, many of which are of national and international significance. As Chairman of the Corangamite CMA, it gives me great pleasure to present the Corangamite Regional Wetlands Strategy 2006-2011.

This is a strategy that encourages a pro-active approach to protecting and managing the region's natural wetlands. Corangamite CMA developed this strategy recognising the value of our wetlands. Approximately five per cent (by area) of the Corangamite landscape consists of wetlands of various types. The region is privileged to have 11 wetlands which form part of internationally-recognised Ramsar sites, and an additional 24 wetlands recognised as significant at a national level (Directory of Important Wetlands Australia). There are also hundreds of other wetlands in the region that have no formal recognition, but are a very important part of our landscape.

Wetlands are a priceless natural asset. During floods they store water, releasing it slowly into the environment. They filter pollutants from water and replenish groundwater systems. Wetlands provide homes to birds, animals, insects and plants, and are of great cultural and spiritual significance for indigenous people. They provide our community tourism and recreation opportunities such as fishing, boating and bird watching, and are also used for commercial fisheries and other farming businesses.

During the past 200 years, the health and number of wetlands in the region has declined. Our forebears drained wetlands for the same reason they cleared vegetation – to make land more productive. Since then we have learned the importance of wetlands to our environment, and it is up to us to protect our natural assets for future generations.

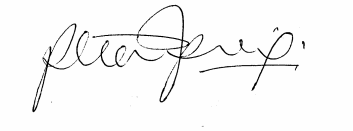
The Corangamite CMA is rolling out new and innovative programs to deliver the outcomes of this strategy. *WetlandTender* is a competitive bid process offering landholders the opportunity to gain financial support to maintain or improve their natural wetlands. The Wetlands Benchmark Assessment project will provide a greater insight into the region's wetlands through a representative benchmark of wetland condition. This will inform risk assessment and priority setting for future investment in wetland protection.

History has shown us that wetlands management requires strong leadership, as well as strong partnerships between agencies, landholders, investors, and those that use and visit wetlands. The Corangamite Regional Wetlands Strategy provides opportunities for future investment by government agencies, regional communities with tourism and individuals to protect, maintain and enhance these wonderful assets.

The Corangamite Regional Wetland Strategy is a useful first-stop reference document for people interested in our regional wetlands and wetland systems. The strategy provides a regional context for wetlands, within a broader state, national and international framework, highlighting the responsibilities that come with such fortune. This document provides a strong foundation for fine-tuning priority setting processes, and a strategic investment plan for meeting the challenge of wise wetland management.

The Corangamite CMA recognises the importance of teamwork between all levels of government and non-government organisations such as landholders, local communities, industry and researchers in order to get the best possible outcome for our wetlands. This strategy is a major step forward in the long-term conservation and management of our wetlands. This is a foundation for future planning and action within our region.

The Corangamite CMA appreciates the contributions of many stakeholders to this document (as detailed within) and we will continue to gratefully accept further guidance for the improvement of the strategy. This document will be reviewed and updated on a regular basis to ensure it provides a framework for promoting the importance of healthy, diverse and productive wetland systems across the region and beyond.



Dr. Peter Greig

Chairman

Corangamite Catchment Management Authority

EXECUTIVE SUMMARY

Introduction

The Corangamite Wetlands Strategy aims to provide a strategic investment framework for the cost-effective and coordinated promotion, protection and enhancement of the region's wetland assets. The Strategy will facilitate the conservation and wise use of regional wetlands so as to maintain, and where practicable, restore their ecological character. Developed with extensive community input, the Strategy reflects the values that the community places on wetlands as a key asset and part of a long term, sustainable landscape, as expressed in the Corangamite Regional Catchment Strategy (RCS) (2003). The Strategy has been guided by the statewide policy that outlines a consistent approach to setting directions for wetland investment as found in 'Policy Framework for Wetlands in Victoria' (DSE 2003). The Wetlands Strategy provides an important sub-strategy to the Corangamite River Health Strategy and will support implementation of the RCS through the achievement of wetland related targets.

Background

The Corangamite region contains over 1,500 wetlands, totaling an area of 65,000 ha. Wetlands are therefore iconic natural assets of the regional landscape. They have a highly dynamic character and support a nationally important biodiversity, including areas such as: coastal swamps, shallow seasonal meadows and marshes, stony-rise lowlands and large permanent saline lakes. Significant losses of wetlands in the region have occurred since 1788 and threatening processes continue, resulting in ongoing loss of wetlands in terms of number, area and condition (CEM 2005). Impacts on wetlands are wide and varied; however drainage is largely responsible for loss in wetland area and changes to remaining wetlands (DCE 1992). Up to 75% of the wetland area occurs on public land; however this reflects just 25% of the wetland number. Most wetlands in the Corangamite region are small (74% are less than 10 ha in area) and the majority of these occur on private land (including the most vulnerable and depleted wetland types, *i.e.* freshwater meadows (93%) and shallow freshwater marshes (94%). Thus, wetland conservation on private property is critical to the preservation of particular wetland types, especially threatened shallow freshwater wetlands.

Vision

The underlying direction for investment in wetlands in the Corangamite region is to over time, 'maintain the extent and enhance the quality of wetlands through a community inspired to wisely use and conserve these assets.' This vision reflects the objectives for wetland investment outlined in the Regional Catchment Strategy (CCMA 2003), Victoria's Biodiversity Strategy (DNRE 1997), and the Victorian River Health Strategy (DNRE 2002b). This vision will be achieved through the development of strong partnerships between government, land managers and landholders.

Goals

The Strategy identifies four broad objectives to achieve the vision.

1. **Management** – improve wetland management.
2. **Awareness** – increase public awareness of wetland benefits.
3. **Prioritisation** – ability to prioritise regional wetlands for investment.
4. **Implementation** – effectively implement the Strategy.

Principles

Principles (derived from DSE (2003)) for wetland investment in the region include:

- Land managers, planners and the wider community should recognise that wetlands, through their ecological and hydrological processes, provide valuable services, products and benefits that are enjoyed by and sustain human populations.
- All wetlands need to be managed wisely to ensure they continue to provide ecological and hydrological functions and services for future generations as well as to conserve biological diversity.
- Ramsar sites must be managed to maintain their ecological character, a national obligation as signatory to the Ramsar Convention.
- Formulation and implementation of planning should promote the conservation and wise use of all wetlands.
- Appropriate measures should be taken to preserve and enhance the environment of migratory birds, particularly those listed under international agreements.
- Effort should be made to raise community awareness of the value, benefits and range of wetland types in an effort to conserve Australia's wetlands through the promotion of their ecological, cultural, economic and social values.
- Land managers and planners have a key role in ensuring that State legislation and policies that relate to wetlands are implemented and that Victoria contributes to meeting Australia's international commitments in relation to the management of wetlands.
- The protection of wetland habitat is vital to conserve the many species of native flora, fauna and ecological communities that depend on wetlands, including threatened species.
- Investment on private land leads to public gain and land managers should be supported to undertake conservation services on their land beyond accepted duty of care.

Strategic Investment Plan

A range of tools, services and mechanisms will be required to promote behavioural change for wetland conservation on private land. The suite of outputs and activities identified in this Strategy, necessary to achieve the goals includes:

- raising community awareness of the value of wetlands in a sustainable landscape;
- establishing an improved understanding of the need for wetland conservation;
- providing skills, experience and training to landholders and those interested in assisting with the conservation of wetlands;
- developing convenient systems to assist in the planning and management of wetlands;
- providing networking and learning opportunities to stimulate interest; and
- providing rewards and recognition for positive behaviour with respect to wetland conservation, while at the same time ensuring compliance with existing legislation to minimise undesirable behaviour.

Where possible, these detailed actions have been assigned a resource cost in order to develop an Investment Plan for the wetland asset.

Implementing the Plan

Implementation of the Strategy will rely on: meeting the resource needs of the strategic investment plan; a regional coordinating forum to oversee its implementation; and the support of the various partners and stakeholders. Achieving the Strategy's goals will be a long-term task. The benefits will be a healthy environment, capable of supporting the communities we live in and the biodiversity upon which we rely.

ACKNOWLEDGEMENTS

The development of this Strategy has involved the collective effort of many interested people within natural resource management and the community. A complete list of contributors is included in Appendix 1.

The active participation and guidance from the Steering Committee has been invaluable to the project. Members included: David May (Chair) (Corangamite CMA), Rebecca Sheldon (Executive Officer) (Corangamite CMA), Nick McCristal (Corangamite CMA), Claire Dennis (Greening Australia (Victoria)), Kate Maltby (Parks Victoria), Lachie Jackson (Parks Victoria), Jeanette Bellchambers (landholder Shelford), Craig Billows (wetland enthusiast & consultant) and Garry Peterson (DSE South West).

The Corangamite CMA also acknowledges: Nick McCristal for his assistance with the development and coordination of the risk assessment workshops, and his review of draft strategies; Anne Buchan for her assistance with the development of the Strategy's strategic framework; Greg Peters for his review of the Strategy and assurance of alignment with the River Health Strategy; and Rebecca Sheldon who undertook the challenging task of developing the Corangamite Wetland Strategy.

View across Lake Connewarre, Bellarine Peninsula

ABBREVIATIONS AND GLOSSARY

Biodiversity	The variety of all life forms, the different plants, animals and micro-organisms, the genes they contain and the ecosystems of which they form a part
Bioregion	Biogeographic areas that capture the patterns of ecological characteristics in the landscape or seascape, providing a natural framework for recognising and responding to biodiversity values
CAMBA	China and Australia Migratory Bird Agreement
CCMA	Corangamite Catchment Management Authority
DIWA	Directory of Important Wetlands in Australia
DPI	Department of Primary Industries (previously a part of the Department of Natural Resources and Environment)
DSE	Department of Sustainability and Environment (previously a part of the Department of Natural Resources and Environment)
Ecological character	The combination of the ecosystem components, processes and services that characterise the wetland at a given point in time
Ecoservices	Also described as ecosystem services – ecosystem related services that benefit humans (*e.g.* flood protection, water purification)
Environmental flows	The amount of water required by a river, lake or wetland to enhance the environmental values of the water body
EVC	Ecological Vegetation Classes – a type of native vegetation classification that is described though a combination of its floristic, life form, and ecological characteristics, and through and inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities that occur across a biogeographic range
IWC	Index of wetland condition
JAMBA	Japan and Australia Migratory Bird Agreement
LCC	Land Conservation Council
LIDAR	LIDAR is an acronym for LIght Detection And Ranging. LIDAR systems are airborne laser systems, flown aboard rotary or fixed-wing aircraft, that are used to acquire coordinates of terrain and terrain features that are both manmade and naturally occurring
MAT	Management Action Target (1 – 10 year targets)
NAP	National Action Plan (for Salinity and Water Quality)
NHT	Natural Heritage Trust
NRM	Natural Resource Management
PV	Parks Victoria
Ramsar	The Convention on Wetlands of International Importance, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
RCS	Regional Catchment Strategy
RCT	Resource Condition Target (10 – 30 year targets)
Wise use	Maintenance of ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development

1 INTRODUCTION

Chapter one establishes the need for and defines the purpose of the Corangamite Wetlands Strategy. The scope, strategic context and consultative framework for Strategy development are also outlined.

1.1 Purpose of Strategy

The purpose of the Corangamite Wetlands Strategy, (hereafter referred to as the Strategy), is to provide a strategic investment framework for the cost-effective and coordinated promotion, protection and enhancement of the region's wetlands. The Strategy will facilitate the conservation and wise use of regional wetlands so as to maintain, and where practicable, restore their ecological character. This will be achieved through the development and implementation of a strategic investment plan, outlined in the strategic framework chapter of this document (chapter 3). Inclusion of the Investment Plan within this public document follows the precedent set by other CMA sub-strategies, *i.e.* River Health Strategy (CCMA 2005b) and Corangamite Native Vegetation Plan (CCMA 2005a), and is important for relationship building with stakeholders and the community, in terms of promoting transparent strategic planning and investment options. This plan will also assist in the development and monitoring of existing and proposed Resource Condition Targets (RCT's) (section 1.3).

To date, wetlands investment in the Corangamite region has been somewhat ad hoc and focused on Ramsar sites, despite there being over 1,500 wetlands within the region. Priorities for wetland conservation are currently determined through reference to often unsubstantiated information of condition, values and threatening processes. Consequently, it is not possible to adequately determine investment and conservation needs, or to quantify resource requirements in meeting these needs.

Current investment in the Corangamite region uses best management practices as a basis as well as the existing data sets for priority setting. An increased understanding of how resources can efficiently be allocated to achieve the best results is however essential for effective wetland conservation in the longer term. This requires the establishment of transparent and highly defensible priorities for the allocation of funds, personnel and community efforts.

Knowing the location, distribution and character of wetlands and their values, uses and threats, is essential for developing and implementing management strategies for their wise use (Finlayson and van der Valk 1995). This is required at geographical scales ranging from the site level, to the development of regional strategies, which include regional priority setting. This emphasises the need for the development and implementation of this Strategy and associated action plans (section 1.3).

The Strategy aims to provide a firm foundation for wetland investment for:

- Corangamite Catchment Management Authority (CCMA) as well as State and Australian Government investors;
- key agency stakeholders such as Local and Victorian Government who have a commitment to wetland conservation and require regional direction for their activities; and
- other potential partners within the regional community (including general community, agencies and industry sectors) who may wish to become involved in wetland conservation.

The Strategy aims to meet the following regional needs:

- provide the rationale for strategic directions in wetland management and investment within the Corangamite region;
- document the current knowledge base for regional wetlands;
- identify significant wetlands within the region;
- determine priority areas and activities for wetland investment and the most effective mechanisms for achieving strategic objectives;
- provide a framework for the coordination of roles and responsibilities of the CCMA and it's partners in wetland protection and management;

- identify opportunities to integrate wetland management with other NRM issues (plans, strategies and programs), at appropriate scales, for multiple benefits; and
- present a comprehensive, logical and transparent investment framework that will confidently attract secure investment for Strategy implementation.

1.2 Scope

Strategy development has been guided by statewide policy that outlines a consistent approach to setting directions for wetland investment as found in 'Policy Framework for Wetlands in Victoria' (DSE 2003). This Strategy promotes logical and transparent strategic planning which identifies the vision, objectives, outcomes and actions required to direct wetland investment.

Due to the lack of data for up to 98% of regional wetlands (ABRG 1988), this Strategy does not contain comprehensive data analyses or prioritisation of individual wetlands. Rather, it promotes a strategic approach to wetland conservation at the regional level. This Strategy has an emphasis on programs and partnerships that are under the CCMA's influence or control. It is focused on increasing the knowledge base of regional wetlands and therefore the ability to prioritise wetlands for future investment. The creation of essential baseline datasets is needed to better inform current risk assessment and management practices. The Strategy also aims to increase the awareness of wetland values amongst the broader community, as well as improve implementation and monitoring systems.

This strategic document incorporates three distinct chapters as outlined in Figure 1. Chapter one includes the rationale, scope and strategic context for Strategy development. Chapter two includes information on regional wetlands encompassing values, threats and current conservation activities. The final chapter (chapter 3) contains the strategic investment plan, mechanisms for Strategy implementation, and monitoring and evaluation framework. This chapter also contains the scope for wetland action plans and prioritisation framework.

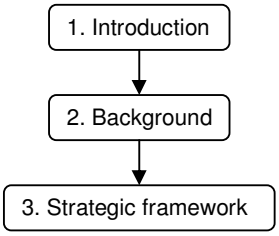


Figure 1 Basic chapter structure of the Strategy

Several background papers prepared or commissioned by Corangamite CMA have assisted in the development of this Strategy. These include the Landholder Wetlands Perception Study (CRIC & CEM 2004), Corangamite Wetlands Inventory (CEM 2005) and Wetlands Risk Assessment Workshop Report (Sheldon 2005). Key findings and recommendations issued in these documents have been collated to inform and support the development of the Strategy and associated investment plan.

This Strategy focuses on natural inland lakes and swamps. Estuaries and intertidal mudflats are not covered, neither are artificial wetlands (these are briefly discussed within the Strategy). In-stream habitat, bays and estuaries are dealt with in the Corangamite River Health Strategy (CCMA 2005b).

1.3 Strategic Context

1.3.1 The Corangamite CMA

The Corangamite CMA is one of ten regional natural resource management (NRM) authorities, which operate within Victoria. The CMA's were established and operate under the provisions of the *Catchment and Land Protection Act 1994* and also have responsibilities under the provisions of the

Water Act 1989. The Mission of the Corangamite CMA is to protect and restore regional land and water resources, encourage the sustainable development of natural resource-based industries and conserve regional cultural heritage. The CCMA is responsible for the development of a Regional Catchment Strategy (RCS) (refer to Section 1.3.2 below) as well as sub-strategies which seek to guide investment for key regional assets. The CCMA also acts as a conduit for information between the Australian and state governments and the regional community and as an intermediary for funding from the Australian and state government for regional NRM priority activities.

1.3.2 The Regional Catchment Strategy

The Regional Catchment Strategy (RCS) 2003-2008 (CCMA 2003) provides long-term directions for managing the future of land, water resources, biodiversity, and seascape of the region. It is the foundation for investment decisions to ensure improved natural resource outcomes.

The RCS framework is supported by a series of sub-strategies and plans that provide direction for specific asset and threat programs (see Figure 3 in section 1.4). These plans include the River Health Strategy (RHS), Native Vegetation Plan, Salinity Action Plan and Rabbit and Weed Action Plans among others. The Wetlands Strategy provides an important cornerstone to the RHS and will support RCS implementation and the ability to meet wetland specific Aspirational Targets (20 – 50 year targets), Resource Condition Targets (RCT's) (10-30 year targets) and Management Action Targets (MAT's) (1-10 year targets) as outlined below.

Wetland specific Aspirational Targets:

- healthy rivers and streams, lakes and wetlands;
- achieve a net gain in extent and quality of native vegetation across the entire landscape;
- improved conservation status of all native vegetation communities and flora species; and
- improved conservation status of all native fauna species.

Wetland specific RCT's:

- Ramsar lakes and wetlands to meet at least the minimum Ramsar requirements by 2010; and
- maintain the area of those wetland types where their extent has declined since 1788.

Wetlands specific MAT's:

- develop an index of wetland and estuary condition assessment; and
- develop a Regional Wetlands Strategy.

As outlined above, a key MAT of the RCS is the development and implementation of a Regional Wetlands Strategy. The development of an Index of Wetland Condition (IWC) is a state-wide project currently being coordinated by the Department of Sustainability and Environment (DSE) (this project is discussed further in section 2.4).

The Strategy will be finalised in 2005/06 and the development of action plans will commence concurrently in order to prioritise wetland investment on a sub-regional level. This will involve the development of annual works plans and will detail provision of responsibilities and proposed timelines for future action (see section 3.7 for action plan development). These wetland action plans will contain detailed technical information with respect to prioritising and targeting wetlands and wetland systems for investment at the sub-regional scale. It is proposed that wetland action plans be developed in accordance with landscape zone plans which are expected to become targeted and integrated management plans for the region. A landscape zone plan is to be piloted during 2005/06. Wetland actions will be incorporated into this pilot document. Further landscape zone plans will be developed in future years dependent upon the success of this pilot. Wetland action plans will not be publicly released as separate stand-alone documents; rather they will be automatically integrated into these landscape zone plans in the planning stage.

The Strategy is to be reviewed every five years in conjunction with wetland action plans. Recommendations and needs for future wetland investment identified in this strategic framework (chapter 3) will be incorporated into regional planning and investment via the mechanisms presented in Figure 2.

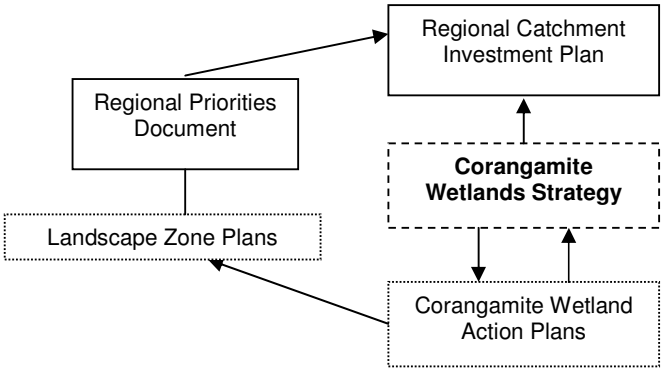


Figure 2 Annual Strategy and Action Plan Inputs to Corangamite CMA Investment Planning

The Strategy and associated action plans will facilitate progression towards the achievement of RCT's as well as outline the monitoring and evaluation mechanisms by which progress can be monitored and adequately reported upon. The Strategy will, in the longer term, inform the development of RCT's to be incorporated in future RCS's.

1.4 Consultative Framework

The Strategy has been developed with the assistance of a steering committee which has provided direction and feedback on Strategy issues and development. Key regional stakeholders have been engaged with via three wetland risk assessment workshops [see Appendix 1 and Wetlands Risk Assessment Workshop Report (Sheldon 2005)]. Landholders and natural resource management staff also contributed indirectly through the Wetland Perceptions Study (CRIC & CEM 2004). The Strategy, now a public document, was formalised through an internal approval process and was subject to a public comment phase commensurate with Corangamite CMA consultative processes (Figure 3). Comments received during this phase were considered during Strategy finalisation.

Freshwater Lagoon, Bellarine Peninsula

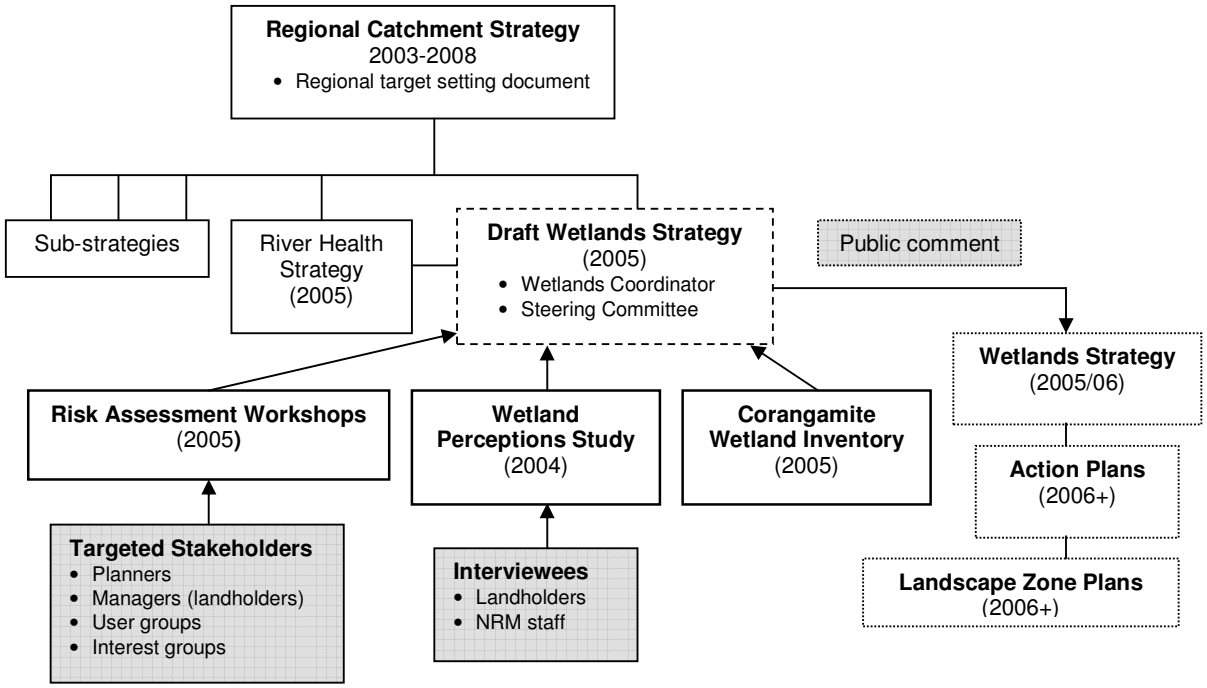


Figure 3 Strategic Context and Consultative Framework for Strategy Development

Floating Islands Reserve – Stony Rises

2 BACKGROUND

Chapter two commences by exploring the definition of a wetland and the array of wetland classification systems used within Australia. Wetland values and threats are discussed in generic terms and then in a regional context. An overview of the Corangamite region is given and significant wetland assets are discussed. This is followed by a brief summary of current investment activities and key wetland policy and legislation.

2.1 Wetlands in Victoria

Wetlands are a unique part of Victoria's landscape and are iconic natural assets of the Corangamite region. Wetlands are among the most productive ecosystems on Earth and provide a range of environmental, social and economic services, which we are only beginning to comprehend. Major changes have occurred in Victoria in terms of wetland number and area, approximately one third of Victoria's wetlands have vanished since 1788, with greatest losses sustained on private land (DCE 1992).

2.1.1 Wetland Definition

Wetlands are difficult to define and classify. The definition used by the Convention on Wetlands of International Importance, also known as the Ramsar Convention, is used to define wetlands broadly within Australia and therefore within this Strategy:

> *"Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. Wetlands may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands"* (Convention on Wetlands, Ramsar, 1971).

2.1.2 Wetland Classification Systems

Various classification systems for wetlands exist throughout Australia. The basis for wetland classification in Victoria is the definition and classification of wetlands as described in the Ramsar Convention. This system separates wetlands into three broad categories (marine/coastal, inland and human-made wetlands) and was used to classify wetlands in the Corangamite Wetlands Inventory (CEM 2005). Local modifications to this system have been made to ensure it is relevant to Victoria. This modified system is used to classify wetlands in the 'Directory of Important Wetlands in Australia' (DIWA) (Environment Australia 2001) (see Appendix 2 for the Ramsar and DIWA classification systems).

In Victoria, wetlands are usually classified into nine categories based on the Corrick classification scheme. This system has been used to comprehensively categorise and map wetlands greater than one hectare according to depth, period of inundation, salinity and dominant vegetation (Corrick and Norman 1980) (Table 1). This extensive work compiled in the 1970's formed the basis for the development of the DSE Wetland Database (DCNR 1995), the primary tool currently existing for wetland planners.

The Corrick classification system has been criticised for its inability to accurately define ecologically distinctive wetland types due to the use of broad wetland categories (Beilharz 1996). Wetland categories defined by this scheme are based on attributes that are important to water birds, and they fail to distinguish between different landforms or geomorphic origins. Therefore, wetlands may be classed as the same category, yet support quite different species and communities, as a result of widespread geographical/biophysical difference (Beilharz 1996).

Table 1 Corrick's Wetland Classification Scheme (Corrick and Norman 1980)

Category/sub-category of wetland	Depth (m)	Duration of inundation
FRESHWATER		
1. Flooded River Flats	< 2	
2. Freshwater Meadow • Herb-dominated • Sedge-dominated • Red Gum-dominated • Lignum dominated	< 0.3	< 4 months/year
3. Shallow Freshwater Marsh • Herb-dominated • Sedge-dominated • Cane grass-dominated • Lignum-dominated • Red Gum-dominated	< 0.5	< 8 months/year
4. Deep Freshwater Marsh • Shrub-dominated • Reed-dominated • Sedge-dominated • Rush-dominated • Open Water • Cane grass-dominated • Lignum-dominated • Red Gum-dominated	< 2	Permanent
5. Permanent Open Freshwater • Shallow • Deep • Impoundment	< 2 > 2	Permanent
SALINE*		
6. Semi-permanent Saline • Salt pan • Salt meadow • Salt flat • Sea rush-dominated • Hypersaline lake	< 2	< 8 months/year
7. Permanent Saline • Shallow • Deep • Intertidal Flats	< 2 > 2	Permanent
20. Sewage oxidation basin**		
21. Salt evaporation basin**		

* Saline wetlands are those in which salinity exceeds 3,000 mg/L (approx. 4,400 EC) throughout the entire year.

** Sewage oxidation basins and salt evaporation basins include artificial wetlands used for sewage treatment and salt concentration. Both provide important habitat for water birds including significant migratory species (Corrick and Norman 1980).

Different wetland types characterise different landscapes. Freshwater meadows are common in the central west of the region and are found around Camperdown, whereas saline wetlands are a feature of the Victorian Volcanic Plain, near Colac. Other systems are used to classify wetland vegetation types. Classification systems such as Ecological Vegetation Classes (EVC's) are a type of native vegetation classification system that is described through a combination of floristics, life form, and ecological characteristics (DNRE 2002d). Each EVC includes a collection of floristic communities that occur across a biogeographical range, with similar habitat and ecological processes in operation (DNRE 2002d). Current EVC descriptions are poor for wetland and riparian systems; however a project to further develop EVC benchmarks for wetland habitats has commenced and will be incorporated into the design of the IWC (DSE 2003).

Few regional wetland classification schemes have been developed. However wetlands in the Colac area were divided into six zones based on geology and related hydrology in the late 1980's to 1991, for the purpose of an inventory initiated by the former Wetlands Unit of the Department of Conservation and Natural Resources (Appleby 1991). Development of a region specific wetland classification scheme modelled on Corrick's scheme will be scoped during the action planning phase, in an attempt to enable a more meaningful prioritisation of wetlands for investment and to ensure a truly comprehensive, adequate and representative reserve system.

2.1.3 Wetland Values

Wetlands are an essential component of the landscape and help to perform a range of services which include: water quality maintenance, flood mitigation, habitat provision, feeding, breeding and summer refuge areas. Wetlands are also important in economic and social terms. They are valuable resources for fishing, bird watching, tourism, heritage, education and research.

Wetland complexes contain a number of associated wetlands (potentially consisting of a variety of wetland types) and are a high value asset, particularly in terms of the biological diversity which they support. Both Ramsar sites within the Corangamite region contain a series of proximal and associated wetlands (a wetland complex), which are also relatively diverse.

Table 2 provides a comprehensive list of general wetland values and services, however key values and benefits of regional wetlands are listed and summarised in section 2.3.2.

Table 2 The Importance of Wetlands (Holmes & Papas 2004)

Wetland values	Ecosystem service
Maintenance of hydrological stability (both groundwater and surface water)	• Flood retardation • Groundwater replenishment
Climate change regulation	• Sequester carbon
Local climate mitigation	• Stabilisation of local climatic conditions, particularly rainfall and temperature
Sediment and nutrient retention and export	• Slow fold waters and cause sediment deposition • Accumulate waste nutrients • Process waste nutrients into wetland vegetation which can be harvested or removed
Water purification	• Receive, dilute or remove wastewater from irrigation areas, urban areas and sewage treatment plants
Food web support	• Nutrient cycling • Primary production
Reservoirs of biodiversity	• Support threatened species or threatened ecological communities • Provide refuge in drought

Table 2 continued

Wetland values	Ecosystem service
Wetland products	• Provide drinking water for humans and livestock • Provide water for irrigated agriculture • Provide water for industry • Provide sustenance for humans (*i.e.* fish) • Support aquaculture • Provide timber • Provide livestock fodder • Deliver and store water as part of water supply systems
Recreation and tourism	• Recreational fishing and hunting • Water sports and activities • Picnics, outings and touring • Nature observation
Biological control of pests and diseases	• Predators of agricultural pests (e.g. Ibis feeding on grasshoppers)
Cultural value	• Inspiration • Aesthetic values • Cultural heritage (historical and archaeological) • Spiritual and religious • Sense of place • Educational values • Knowledge systems

2.1.4 Wetland Threats

The impacts on wetlands are wide and varied. Wetlands are directly linked with their surrounding landscape. This landscape forms the catchment of the wetland, and activities that occur in the catchment can ultimately impact on the health and functioning of the wetland.

Major impacts affecting Victoria's wetlands include:

- salinisation;
- drainage;
- alteration to natural water regimes;
- reduced water quality;
- uncontrolled grazing; and
- vegetation clearing (especially grassland wetlands) (DSE 2003).

Table 3 lists the general threats (or risks) that may occur at a wetland and the likely impacts associated with these. The impact of the threat will be dependant on: the geographical area; existing catchment processes; underlying local, catchment and landscape scale issues (such as salinity); and any management actions put in place to reduce the impact (DSE 2003). These impacts result from activities onsite, on adjoining land, and in the wetlands' catchment. Protection of wetlands therefore requires an integrated approach.

Table 3 Threats Impacting on Wetland Values (DSE 2003)

Cause (threat/risk)	Effect (impact)
Physical change to the wetland including: • land filling • drainage • damming • dredging • mining • land forming • cultivation • inappropriate shoreline 'erosion' control measures (sea walls, tyre walls)	• Physical destruction of wetland habitat • Alteration to wetland landform • Changes in water depth • Loss of specific habitat features (*e.g.* littoral zone) • Soil destabilisation • Increased salinity levels • Loss of biodiversity • Impacts on flora and fauna (especially threatened species)
Water storage, regulation and extraction: • construction and management of reservoirs and storages • river regulation • thermal pollution from dam releases • artificial opening and closing of estuary mouths • impairment of tidal movements • impairment of water movement on floodplains and in natural drainage lines (by levee banking or natural drainage line obstruction) • diversion and extraction of surface water • extraction of groundwater	• Alteration to natural water regimes • Alteration to natural water temperature regimes • Reduced recruitment opportunities for native species • Loss of tidal influence • Alteration to habitat (*e.g.* drowning of native woody vegetation such as Red Gums) • Impaired species movement • Changed water table depth • Loss of biodiversity • Impacts on flora and fauna (especially threatened species)
Poor land use practices in wetland catchments: • clearing native vegetation (excess runoff and raised water tables) • poor irrigation practices (resulting in unnatural watering of the wetland) • excessive fertiliser use • erosion	• Salinisation • Alteration to natural water regimes • Groundwater intrusion • Poor water quality • Turbidity • Sedimentation • Loss of biodiversity • Impacts on flora and fauna (especially threatened species) • Algal blooms
Poor management of wastes and pollutants including: • inadequate sewage treatment • poor storm water management • littering and dumping of rubbish • industrial discharges • oil/chemical spills • disposal of irrigation tail waters • disposal of farm effluent	• Poor water quality • Pollution • Fauna mortality and injury • Fauna mortality or sub-lethal effects • Vegetation damage • Alteration to natural water regimes • Alteration to natural water temperature regimes

Table 3 continued

Cause (threat/risk)	Effect (impact)
Recreational impacts	• Vegetation damage • Disturbance to fauna • Soil destabilisation and compaction • Water pollution • Litter • Spreading of pathogens/weeds

2.2 Policy Framework

There are a range of existing plans and strategies that provide for the protection and enhancement of the natural and cultural values of our regional wetlands. Victoria has a strong planning framework and as a result relevant plans and strategies demonstrate a high level of integrated planning and address many aspects of wise use (DSE 2003). The suite of relevant international conventions and Australian and Victorian legislation/policy that direct management and use of Corangamite wetlands are listed and described in Appendix 7. Key legislative instruments relating to wetland management in the Corangamite region are shown in Figure 4.

2.2.1 Roles and Responsibilities

Managing wetlands to maintain and enhance their values depends on the coordination of natural resource use in wetlands and their catchments. Wetland management is therefore an exercise in cross-sectoral coordination. Achieving coordination depends on facilitating and regulating a range of economic and social uses of natural resources, which inevitably involves a large number of laws, regulations and policies (see section 2.2 and Appendix 7). It also requires coordination between agencies with complimentary jurisdiction (Brett Lane and Associates Pty Ltd 2003). A suite of agencies is responsible for the natural resource management of the land and waters encompassing the Corangamite region. A brief overview of key regional agencies/stakeholders and their roles and responsibilities relating to wetland management and use within the Corangamite region is provided in Appendix 8. Major stakeholders in regional wetland management, besides the CCMA, include:

- Land managers (including private landholders and Parks Victoria);
- Commonwealth and State Government agencies;
- Water Authorities;
- Local Government;
- Victorian indigenous communities; and
- Non government organisations.

Coordination and integration between the agencies and stakeholders involved in wetland management is essential and has clear benefits for wetland conservation. Stakeholders of current and major CCMA funded wetland projects include Greening Australia, Parks Victoria, City of Greater Geelong and private landholders (section 2.4). A major objective of this Strategy is to facilitate the coordination and integration of stakeholder groups and government agencies. Implementation of the Strategy will provide increased engagement of Landcare networks, regional DSE and Local Government, among others, not directly involved with CCMA wetland projects at this time.

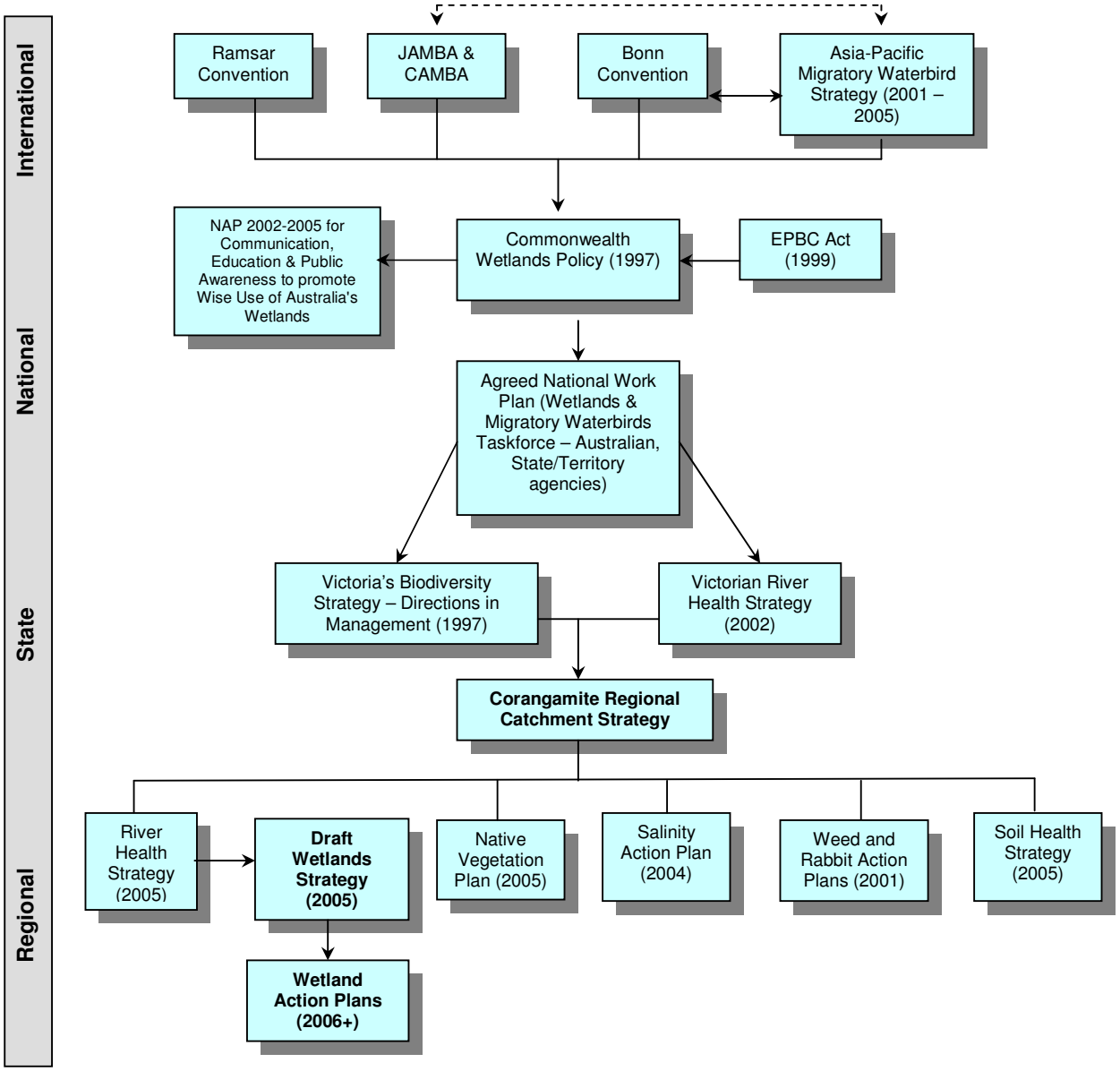


Figure 4 Key Policy and Legislation Relating to Wetland Management in the Corangamite Region

2.3 The Corangamite Region

This Strategy collates existing data on wetlands and uses it to inform catchment-scale decision making. In general, knowledge of wetlands is not as good as it is for many other natural resource management issues, *i.e.* river health. We have coarse knowledge of wetland extent and wetland types, but data on condition, values and threats is severely limited.

2.3.1 Regional Overview

The Corangamite CMA region (Figure 5) covers an area totalling 1,334,000 ha. It comprises four major river basins: the Barwon River, Moorabool River, Lake Corangamite and Otway Coast; and 56 identified sub-catchments. The region includes all or part of the following municipalities: Cities of Ballarat and Greater Geelong; the Borough of Queenscliff; and the Shires of Moorabool, Surf Coast, Corangamite, Golden Plains, Colac Otway and Moyne.

The Corangamite CMA region also contains five bioregions: Central Victorian Upland, Otway Plain, Otway Ranges, Victorian Volcanic Plain and Warrnambool Plain.

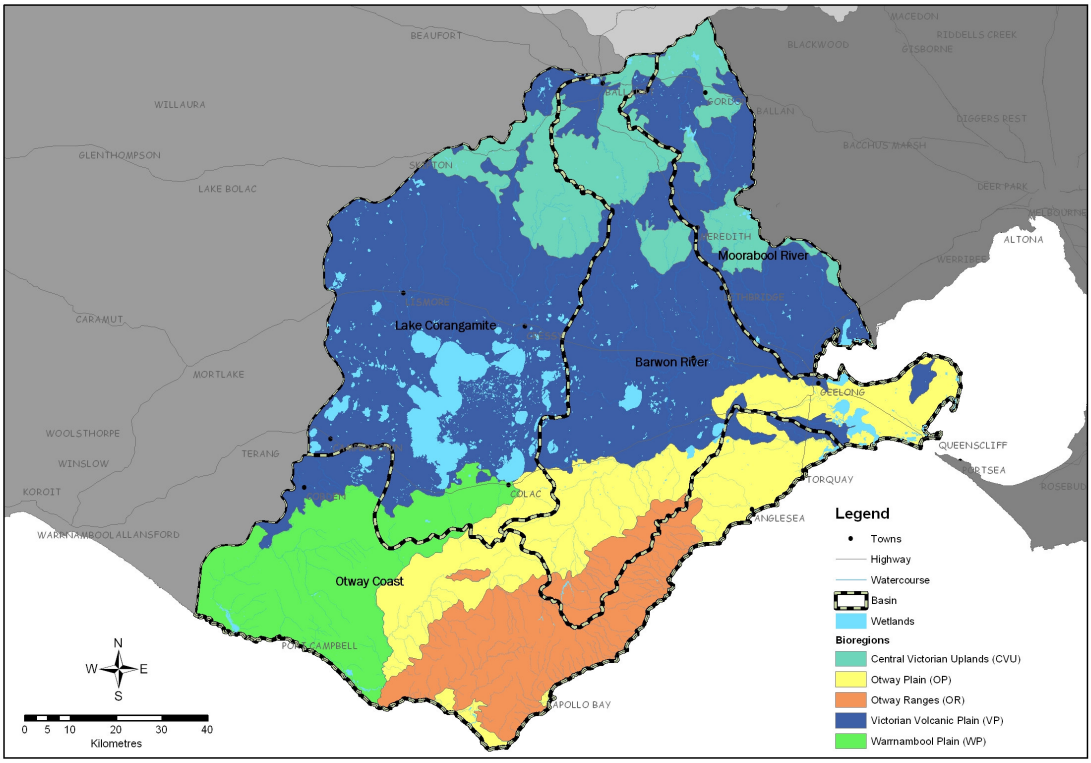


Figure 5 Corangamite CMA Region

For management purposes and future planning, the Corangamite CMA has sub-divided the four river basins into 15 management units referred to as landscape zones (Figure 6). These zones were developed using the following criteria:

- major waterway sub-catchments;
- bioregions;
- existing remnant vegetation; and

- existing and potential community capacity to implement on ground works (*i.e.* Landcare group boundaries).

Landscape zones have been developed in conjunction with the Native Vegetation Plan, River Health Strategy, Salinity Action Plan and recent annual Regional Priorities Documents to provide consistency across RCS sub-strategies when dealing with issues at the sub-regional level. These landscape zones will form the basis of management actions compiled in wetland action plans to guide future wetland investment (chapter 3).

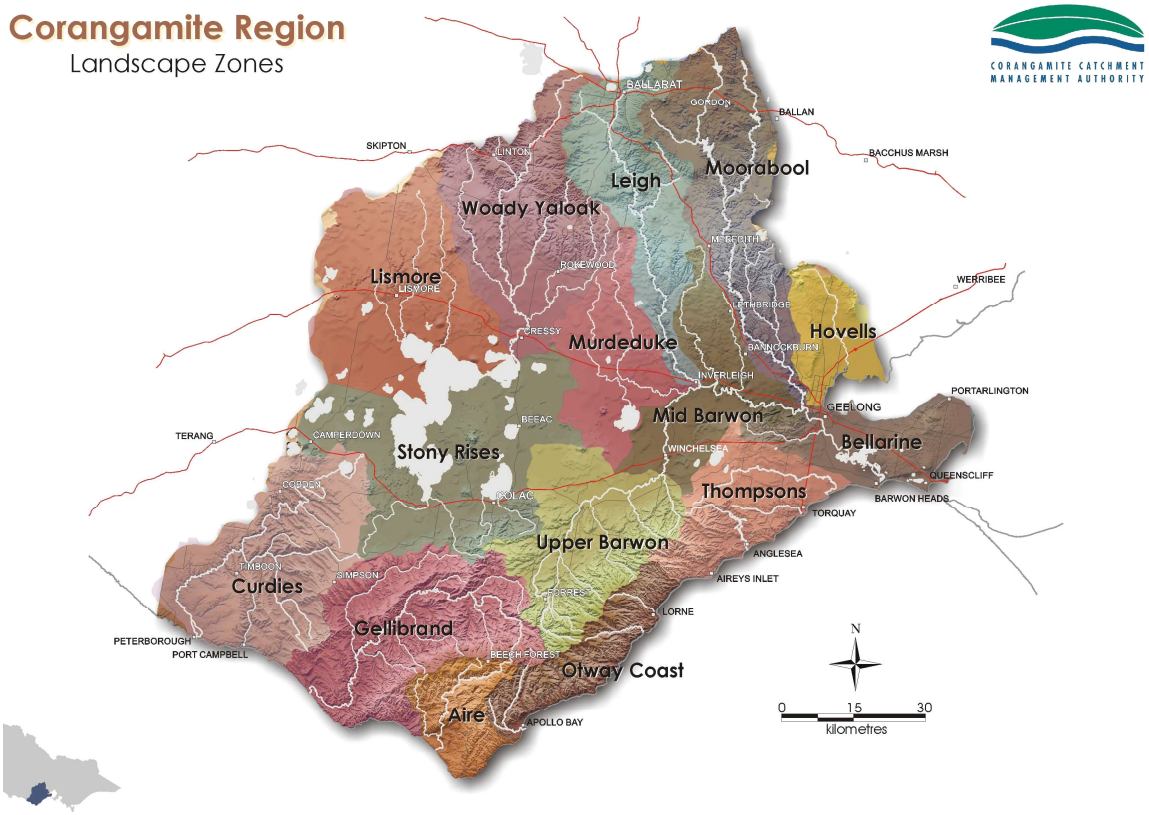


Figure 6 Corangamite CMA Landscape Zones

Table 4 Landscape Zones and Major Wetlands Within the Corangamite Region

Basin	Landscape zone	Major wetlands/significant sites	Wetland no.	Wetland area (ha)
Moorabool	Moorabool	Geringhap Swamp, Durdidwarrah Reservoirs, Lal Lal Reservoir, Moorabool Reservoir, Korweinguboora Reservoir, Wilson Reservoir, Beale's Reservoir, Upper Stony Creek Reservoir, Bostock Reservoir, Bolwarrah Weir	117	1,296
	Hovells	Avalon Airfield, Point Wilson to Limeburners Bay	42	1,038
Lake Corangamite	Woady Yaloak	Dereel Swamp, Winter Swamp	92	4,483
	Stony Rises	Lake Weering, Lough Calvert, Lake Beeac, Lake Cundare, Lake Ondit, Lake Colac, Lake Purdiguluc, Lake Coragulac, Floating Island Lagoon, Lake Weeranganuk, Lake Koreetnung, Round Lake, Lake Kariah, Lake Colongulac, Carter Swamp, Dreeite Nature Conservation Reserve	516	27,787
	Lismore	Cundare Pool, Lake Martin, Lake Rosine, Lake Corangamite, Lake Coradgill, Lake Gnarpurt, Lake Terangpom, Lake Logan, Lake Struan, Lake Tooliorook, Deep Lake, Lake Milangil, Kooraweera Lakes	180	15,542
Barwon	Bellarine	Lorne Lake, Lake Victoria, Port Phillip Heads Marine National Park, Connewarre State Game Reserve, Moolap Salt Works, Salt Lagoon, Belmont Common, Cox's Lagoon, Portarlington sewage treatment ponds	128	5,142
	Mid-Barwon	Lake Gherang, Wurdiboluc Reservoir	96	841
	Upper Barwon	Lake Burn, West Barwon Reservoir, Lake Ayrey, Lake Thurrumbong, Lake Elizabeth	50	943
	Leigh	White Swan Reservoir, Lake Wendouree, Gong Gong Reservoir, Kirk Reservoir, Pincott Reservoir, Bingley Swamp	71	586
	Murdeduke	Wingeel Swamp, Lake Murdeduke	69	2,948
Otway Coast	Aire	Lake Costin, Lake Craven, Lake Calder, Lake Hordern	4	88
	Curdies	Lake Purrumbete, Curdies Inlet	89	1,569
	Gellibrand	West Gellibrand Dam, Olangolah Weir	46	365
	Otway Coast	The Backwater, Allen Reservoir	3	19
	Thompson	Lake Modewarre, Brown's Swamp, Breamlea Flora and Fauna Reserve, Painkalac Reservoir, *Airey's Inlet Sewage treatment ponds, Black Rock sewage treatment ponds	56	1,615

Source: DCNR (1995). *Addition since the 1994 Wetlands GIS layer

Corangamite's Wetlands

The Corangamite region contains over 1,500 wetlands, totalling an area of 65,000 ha which represents five percent of the CCMA region's entire area. Wetlands are therefore an integral part of the landscape. They support a rich array of unique flora and fauna and represent some of the most significant recreation and tourism attractions in the region. Regional wetlands include such areas as coastal swamps, shallow seasonal meadows and marshes, stony-rise lowlands, and large permanent saline lakes.

Most wetlands in the Corangamite region are small in area, with 58% of wetlands being less than 5 ha and up to 74% less than 10 ha in size. However, nine wetlands are greater than 1,000 ha in area, including Australia's largest inland permanent lake, Lake Corangamite (> 24,000 ha).

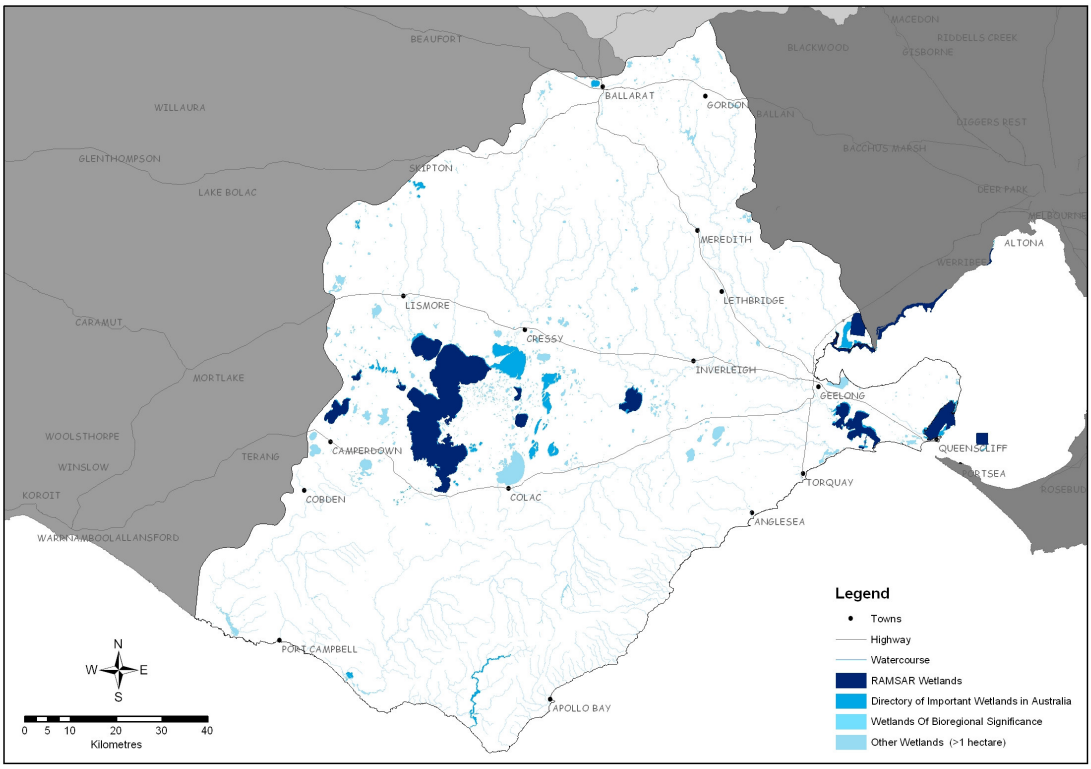


Figure 7 Wetlands within the Corangamite region

It is estimated that over half of Australia's wetlands have disappeared since 1788 and degradation of remaining wetlands is increasing. In Victoria, about 33% of wetlands have disappeared since this time (DCE 1992), the majority of which were of shallow freshwater marsh, and deep freshwater marsh origin (areas of these wetland types have reduced by more than 70% across the state) (Corrick and Norman 1988). These wetland types were also extensively distributed throughout the Corangamite region prior to 1788 (Table 5). Since that time, agricultural and urban development has reduced the area of shallow freshwater marsh and deep freshwater marsh in the region by 78% and 64% respectively. Threatening processes continue, resulting in on-going loss of wetlands in terms of number, area and condition (CEM 2005). The impacts on wetlands are wide and varied; however, drainage is largely responsible for loss in wetland area and changes to remaining wetlands (DCE 1992).

The Corangamite region includes areas of each of the Corrick's classification wetland types, including areas of the state's most depleted wetland habitats, and wetlands least represented in Victoria's protected area network.

Table 5 Change in Area and Number of Corangamite Wetlands Between 1788 and 1994.

Wetland category	Wetland no. 1788	Wetland no. 1994	Proportion remaining (%)	Wetland area (ha) 1788	Wetland area (ha) 1994	Proportion remaining (%)
2. Freshwater meadow	274	294	107	2,517	2,893	115
3. Shallow freshwater marsh	542	254	47	11,383	2,464	22
4. Deep freshwater marsh	102	81	79	7,203	2,564	36
5. Permanent open freshwater	47	489	1040	10,736	11,251	105
6. Semi-permanent saline	256	358	140	7,848	8,433	107
7. Permanent saline	59	76	129	38,227	35,781	94
20. Sewage pond		13			147	
21. Salt works		3			1,499	
Total	1,280	1,568	122	77,914	65,032	83

Notes:

- The increase in number and area of freshwater meadows is attributable to the draining of more permanent wetland types.
- The increase in the number of permanent open freshwater wetlands is attributable to the creation of dams, reservoirs and other open water impoundments (impoundments account for 93% wetland number and 26% wetland area for category 5 wetlands).
- The increase in the number of semi-permanent saline wetlands is attributable to the conversion of more permanent or less saline wetland types.

Source: DCNR (1995).

The number of permanent open freshwater wetlands has significantly increased since 1788 (489%) but the majority is attributable to the construction of farm dams/impoundments. Constructed wetlands provide habitat for some wetland flora and fauna, but are often of low ecological value as they have unnatural water regimes and lack the habitat diversity of natural wetlands. Few artificial wetlands have been created with the purpose of enhancing biodiversity values (DPI 2005). However, constructed wetlands can be purpose built as management tools for dealing with wastewater management, pollution control and irrigation run-off. These artificial systems will increasingly assist with national water management, and will also serve some useful amenity and habitat functions, especially in future development of peri-urban areas.

It is likely that the figures presented in Table 5 and data used for analysis on a state-wide basis, has changed markedly since the Victorian Wetlands Database (DCNR 1995) was finalised in 1994. This demonstrates the need to update mapping on a regular basis and strive to improve the quality of mapping by doing so at finer scales using innovative methods such as remote sensing and Digital Elevation Modelling utilising LIDAR generated data.

Victorian Context (Representativeness)

Victoria's 13,114 wetlands now occupy 535,453 ha or two percent (by area) of the state. These are distributed unevenly across the landscape, with the greatest concentrations occurring in Corangamite, Glenelg-Hopkins and Wimmera CMA regions (DPI 2005). Wetlands within the Corangamite region represent nine percent of the state's wetland number and 12% of the state's wetland area.

The Corangamite region includes significant areas of Victoria's semi-permanent saline (13%), permanent saline (58%), and salt works (82%) wetlands (Table 6).

Table 6 Representativeness of Corangamite wetlands within Victoria.

Wetland category	% of Victoria's wetlands represented within the CCMA region	% of Victoria's wetland area represented within the CCMA region
2. Freshwater meadow	5	2
3. Shallow freshwater marsh	8	5
4. Deep freshwater marsh	5	5
5. Permanent open freshwater	12	6
6. Semi-permanent saline	29	13
7. Permanent saline	40	58
20. Sewage pond	8	4
21. Salt works	75	82

Source: DCNR (1995).

Land Use

Land surrounding wetlands has a fundamental effect on their condition. Key land use changes in the region with the potential to affect wetlands include: cropping (including raised-bed cropping); expansion and intensification of the dairy industry; horticulture; urbanisation; and agro-forestry (including Blue Gum plantations).

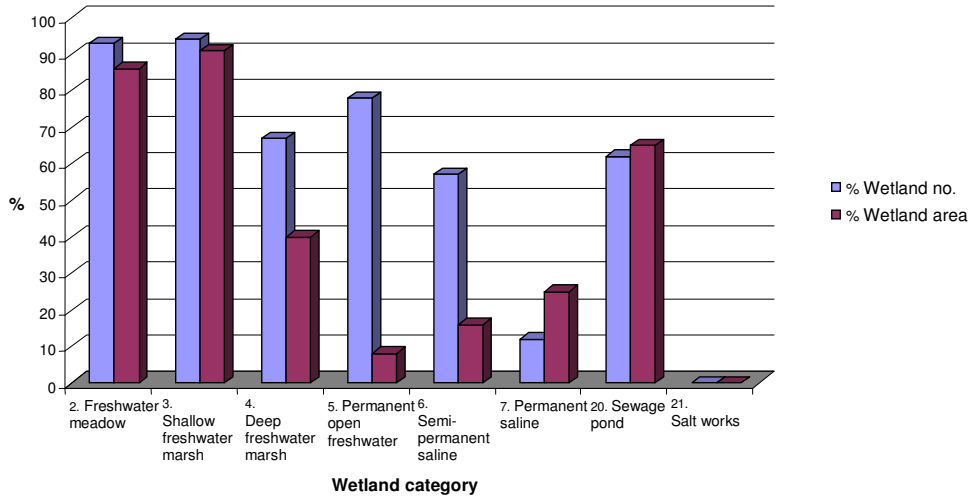
The large majority (75%) of wetlands in the Corangamite region are situated within privately managed, freehold land that is used almost exclusively for agriculture. From the wetland inventory conducted in 2003 (CEM 2005), the most common onsite wetland land use included conservation, grazing and recreation, whereas the major use of land adjacent to wetlands was grazing.

Land Tenure

Three quarters of the wetland area in Victoria is on public land, however this reflects only 20% of the total number of wetlands. Similarly, in the Corangamite region, 75% of the wetland area is on public land representing just 25% of the number of wetlands in the catchment. Wetlands on public land are generally larger and more permanent, while those on private land tend to be smaller and ephemeral (DPI 2005). Wetlands on public land are managed for biodiversity, water storage, wastewater disposal and recreation. Private land wetlands are most often managed within the context of broader agricultural land use.

A number of wetlands and lakes within the Corangamite region, including those listed as nationally and internationally important, were reserved under the *Wildlife Act 1975* as State Game Reserves and Nature Conservation Reserves, and under the *Crown Land (Reserves) Act 1978* as Lake Reserves.

A large proportion of freshwater meadows (93%) and shallow freshwater marshes (94%) occur on privately owned, freehold land (Figure 8). Thus, wetland conservation on private property is critical to the preservation of particular wetland types, especially shallow freshwater wetlands. Management of wetlands on private land primarily involves public education and increased awareness of the importance of wetlands within the community.



Source: DCNR (1995).

Figure 8 Percentage number and area of wetlands on private land in the Corangamite region

The current Victorian reserve system appears inadequate to conserve representative wetland types within the region and is biased towards certain wetland types. Reserve design is of critical importance for the protection and conservation of wetlands, due to the interconnectedness of hydrological and ecological attributes across individual wetlands and the surrounding landscape (Fitzsimons and Robertson 2003). Corrick (1995) suggested that further reservation of important wetlands for biodiversity conservation was required. Land purchase and conservation covenants may be the only options for poorly represented wetland types in this region.

Geographical Distribution

Landscape geomorphology and hydrology plays an important role in determining the position and distribution of wetlands across the Corangamite region. The location of wetlands in the landscape is also important ecologically and for identifying management opportunities.

Wetland bodies are unevenly distributed throughout the Corangamite region with the majority (84% of the wetland area) occurring on the **Victorian Volcanic Plain bioregion**, which covers 46% of the catchment (Table 7 and Figure 6 in section 2.3.1). Within this bioregion, lakes and wetlands have formed in volcanic craters, depressions due to lava collapse, and where drainage patterns have been interrupted by lava flows (LCC 1976). Drainage is mostly internal to lakes or to groundwater. Seasonal variation in hydrology, the type of basalt substrate, and the great variety of catchment-to-surface area ratios and through-flows, combine to produce lakes and wetlands with an unusually wide range of salinities (ABRG 1988).

The **Otway Plain bioregion** supports the second highest number of wetlands within the region. It includes coastal plains, river valleys and foothills from the Bellarine Peninsula, west to Princetown. This bioregion is drained in the east mainly by the Barwon River (which originates in the Otway Ranges) and its tributaries, and several small coastal streams. In the west the bioregion is drained mainly by tributaries of the Gellibrand River, although some streams flow north to lakes Corangamite and Colac, located on the Victorian Volcanic Plain. The Otway Plain contains an extensive range of wetland types and areas. Lake Connewarre in the Lower Barwon area is an internationally important wetland and supports many water bird and wader species. The salt marshes there support the endangered Orange-bellied Parrot following its autumn migration to the mainland. Most other wetlands are small, on freehold land, and are vulnerable to grazing and drainage (DPI 2005).

The identifying features of the **Warrnambool Plain bioregion** are nutrient deficient soils over low calcareous dune formations, and the distinctive cliff coastline. Much of the limestone has been overlain by more recent sediments, and between the limestone dunes, areas of swamplands are characterised by highly fertile peat and seasonal inundation. Important wetlands in the Warrnambool Plain bioregion include the nationally significant inlet of the Lower Curdies River. Most wetlands throughout the region are small and on freehold land. Areas in the Lower Heytesbury are affected by salinity (DPI 2005).

Few natural wetlands occur in the **Otway Ranges bioregion**; however, water production is a primary land use and includes large freshwater impoundments such as West Gellibrand Dam and West Barwon Reservoir. This bioregion accounts for a large proportion of Victoria's forested highlands and includes the Otway National Park.

Wetlands of the **Central Victorian Uplands bioregion** are generally greatly modified, largely as a result of altered flow regimes and the loss and degradation of riparian vegetation. The flatter and more fertile areas of the Central Victorian Uplands were largely cleared for agriculture (DPI 2005). This bioregion is also important for water storage and includes reservoirs such as White Swan, Moorabool, Bostock, Upper Stony Creek, Lal Lal and Korweinguboora, as well as ecologically important wetlands like Dereel Swamp.

Table 7 Distribution of wetlands across bioregions within the Corangamite region

Bioregion	Wetland no.	Wetland area (ha)
Central Victorian Uplands	98	890
Otway Plain	220	5,180
Otway Ranges	8	220
Victorian Volcanic Plain	1,136	54,750
Warrnambool Plain	106	3,992
Total	1,568	65,032

Source: DCNR (1995).

Wetland Condition

Trends in wetland condition in the Corangamite region are difficult to identify due to the lack of data available for the majority of wetlands. However, the occurrence of drainage activity, increasing salinity and various water quality issues attributed to water regulation, have been identified as generally affecting wetland condition. Decline in water bird populations has been attributed to increased salinities in some lakes (CEM 2005). Corrick (1982) noted that wetlands in the Corangamite region have declined substantially in both area and condition since 1788. Condition assessments included in the Corangamite Wetland Inventory (CEM 2005) reported that most wetlands were intact or in moderate condition, with few neither pristine nor severely degraded.

The only attempt to provide a condition/values assessment of wetlands within the Corangamite region on a large scale was conducted by the Australian Biological Research Group (1988). Wetlands contained within the Victorian Wetlands Database (DCNR 1995) were ranked using value systems and the Wetlands Resource Assessment Package (WRAP) database (ABRG 1988). However, detailed biological data was lacking for 98% of the wetlands incorporated in this database, severely limiting its usefulness to provide valid value assessments of wetlands. Few other wetland inventory datasets contain information on the condition of wetlands other than those listed in DIWA or under the Ramsar Convention.

There is currently no accepted, standard measure of the condition of wetlands in Victoria. DSE have developed an Index of Wetland Condition (IWC) which will aim to provide a standardised assessment procedure to address this limitation (see section 2.4). This accepted methodology will assist to ascertain a baseline condition of wetlands within the region, and will also assist with long-term monitoring of regional wetland condition.

2.3.2 Regional Wetland Values

A broad range of values are associated with wetlands as evidenced in Table 2, section 2.1.3. Assessment of values for wetlands in the Corangamite region has been restricted to those listed under national and international inventories. Thus, specific values for the majority of wetlands are generally unknown. An important and challenging fact in natural resource management is that many values/assets can also represent threats to the same systems. Values specific to the Corangamite region were scoped at a series of wetland risk assessment workshops with targeted stakeholders in March 2005 (Sheldon 2005).

The following is a list of priority wetland assets identified at these workshops:

- biodiversity (including habitat, diversity of wetland type, seasonal change, birdlife, threatened species, flora and fauna);
- resources (including commercial, educational, recreational and fish);
- recreation (including bird-watching and fishing);
- aesthetics (including intrinsic value, landscape, scenic, open space, beauty, spiritual and nature appreciation);
- education (including cultural heritage and increased understanding of wetlands); and
- services (including water cleansing, flood mitigation and aquifer recharge).

An overview of values associated with the region's wetlands is provided below in terms of the triple bottom line. Summative details of regional wetland assets, threats and trends (management implications) are further scoped and discussed in the Corangamite Wetlands Inventory report (CEM 2005).

Brolga Family (photo source: Parks Victoria)

Environmental

Wetlands of the region support numerous species of plants and animals, many of which are dependant on such habitat. A total of 101 water-dependant bird species have been recorded on wetlands within the Corangamite region (DNRE 2002a). Many of these are listed as rare and threatened and/or internationally important under several legislative instruments (see section 2.2 and Appendix 7 for legislation and policy information and Appendix 3 for a list of rare and threatened regional wetland fauna).

Species for which the region is important include colonially nesting species such as: Straw-necked Ibis; Sacred Ibis; Pied Cormorant; and Fairy Tern. The area is particularly important for Pelican and Gull-billed Tern, as it contains one of the only active breeding colonies known in Victoria (Corrick 1982). Non-colonial nesting species with restricted distributions in Victoria including Brolga, Australasian Bittern and Chestnut Teal, also occur in the region (Appleby 1991).

The region is also important for non-breeding populations of many nomadic migratory species. Large, permanent lakes of the region provide important drought refugia. The number, diversity, and significance of Corangamite's water bird species have played a significant role in several sites satisfying Ramsar criteria.

A suite of amphibian, reptile and fish species have also been recorded in the region's wetlands, including the nationally listed Warty Bell Frog, Corangamite Water Skink and the threatened Australian Grayling and Yarra Pygmy Perch (Appendix 3).

Over 650 flora species have been recorded from the region's wetlands, 60 of which have been listed as rare and threatened in Victoria (Appendix 4). Of these, four species have been listed as nationally endangered (*Agrostis adamsonii, Cullen parvum*, *Lepidium hyssopifolium and Rutidosis leptorrhynchoides*) and eight species, listed as nationally vulnerable (*Amphibromus fluitans*, *Carex tasmanica, Glycine latrobeana*, *Lepidium aschersonii, Pimelea spinescens ssp. spinescens, Poa sallacustris, Senecio psilocarpus,* and *Xerochrysum palustre)*. Nine species of flora are listed as threatened under the *Flora and Fauna Guarantee Act 1988* (Appendix 4). Several rare and threatened EVC's are also associated with the region's wetlands, including Swamp Scrub, Plains Sedgy Wetland and Lignum Wetland (Appendix 5).

Wetlands also provide environmental services in acting as a sink/store for sediments and nutrients washed from surrounding catchments. The majority of wetlands in the Corangamite region have internal drainage basins and provide this function for small catchments.

Triglochin porcera (Water Ribbons)

Social/cultural

Wetlands have many social and cultural values attributed to them. Aboriginal and European cultural significance is an important value of wetlands in the Corangamite region. The Western District Lakes have been a focus for the Djargurd wurrung and Gulidjand Aboriginal people. Over 48 archaeological sites have been registered within the Western District Lakes Ramsar site, including: fish traps; surface scatters; middens; shelters; and tools (DNRE 2002e). European sites of note include the remains of both a World War II practice range in the northern part of Lake Corangamite and a salt extraction operation at Lake Cundare.

Social values of both natural and constructed wetlands include landscape, aesthetics, education and recreation. Wetlands within the Corangamite region attract visitors who partake in a wide range of activities including fishing, camping, boating, bird watching and duck hunting.

Information, interpretation and education assist enjoyment and foster understanding, appreciation and protection of wetlands and their values. Corangamite wetlands offer a wide range of opportunities for education and interpretation, particularly of wildlife, geomorphological processes, and various assemblages of aquatic and terrestrial vegetation. Due to the diversity, complexity and productivity of wetlands they are often used to teach and demonstrate the scientific principles of ecology, biology, hydrology, chemistry, geology and geomorphology.

The literature review conducted for the Corangamite Wetland Inventory report (CEM 2005) identified 40 research papers with reference to wetlands in the Corangamite region. Research studies have involved the fields of limnology, hydrology and biology. Bird groups including Birds Australia, the Bird Observers Club of Australia, and both the Australian and Victorian Wader Studies Groups, have been involved in long-term monitoring of waders and water birds in the region.

There is much potential for further scientific research on wetlands throughout the Corangamite region. Partnerships with academic and other research institutions will be fostered in an attempt to realise this potential through the implementation of this Strategy and the associated development of an education plan and establishment of research and development priorities.

Economic

Wetlands have important economic values, especially in urban and rural areas, in terms of flood mitigation. Wetlands within the Corangamite region function as natural flood mitigation areas, storing excess runoff and releasing it slowly during times of lower flow.

Wetlands also serve as nurseries for recreational and commercial fish species, and the associated species that support them. Eels, Rainbow Trout and Chinook Salmon have been regularly stocked for recreational fishing purposes in Lakes Murdeduke and Colongulac, amongst others (DNRE 2002e)

Direct economic benefits associated with wetlands of the Corangamite region include agriculture, fisheries, recreation and tourism. A number of particular economic benefits derived from wetlands in the region include:

- pastoral use of land adjoining wetlands, including cattle and sheep grazing, particularly the use of wetlands as drought relief grazing;
- the Swan Bay area provides regionally important tourism and boating;
- commercial tourism operators in Port Phillip Bay, including fishing and boating in chartered vessels, and bird, seal and dolphin watching tours (DNRE 2002c); and
- commercial Eel fishing within the Western District Lakes with an estimated value of over $1 million per annum (Bookar Eel Culture Pty. Ltd. 1983).

Indirect, measurable values of the region's wetlands include groundwater recharge, flood and flow control and nutrient and sediment storage.

Wetland Significance

Internationally and nationally significant wetlands

The Corangamite region contains a number of significant wetlands including major components of two internationally important Ramsar sites: Western District Lakes; and Port Phillip Bay (Western Shoreline) and Bellarine Peninsula. The region also boasts the current inclusion of 24 nationally significant sites listed in DIWA, and 17 sites listed on the National Estate Register (Table 8). Criteria used to list sites of significance under Ramsar, DIWA and the National Estate is included in Appendix 6 and site information sheets can be obtained for individual sites from the following sources:

- Ramsar and Directory of Important Wetlands In Australia - http://www.deh.gov.au/water/wetlands/database/
- National Estate Register - http://www.ahc.gov.au/register/

The Port Phillip Bay (Western shoreline) and Bellarine Peninsula Ramsar site also contains one of Victoria's three East-Asian Australasian Shorebird sites. This site is recognised for supporting Victoria's largest numbers of migratory shorebirds and includes a variety of wetland habitats (Lane 1987) (see Appendix 6 for listing criteria).

View across Lake Corangamite to Mount Elephant - A Western District Lakes Ramsar site

Table 8 Internationally and nationally important wetlands in the Corangamite region

Wetland Name	No. of wetlands	Total area (ha)	Ramsar	DIWA	National Estate Register
Lower Aire River wetlands	4	84		x	
Aire River	-	-		x	
Widderin Swamps	3	359		x	
Princetown Wetlands	3	119		x	
Stonyford-Bungador wetlands	20	64		x	
Red Rock Lakes & The Basins	10	223		x	x
Lower Lough Calvert & Lake Thurrumbong	9	878		x	
Lake Beeac	1	662	x	x	x
Lake Connewarre State Wildlife Reserve	9	3,411	x	x	x
Middle Lough Calvert	2	578		x	
Swan Bay & Swan Island	1	2,800	x	x	x
Lake Colongulac	1	1,400	x	x	x
Lake Murdeduke	1	1,550	x	x	x
Lake Cundare	1	395	x	x	x
Lake Terangpom	1	208	x	x	x
Upper Lough Calvert	2	824		x	
Lake Milangil	1	125	x	x	x
Kooraweera lakes	12	427		x	
Lake Corangamite	1	23,300	x	x	x
Cundare Pool / Lake Martin	1	3,730		x	
Lake Gnarpurt	1	2,350	x	x	x
Lake Wendouree	1	224		x	
Werribee – Avalon area	2	5,460	x	x	x
Banongill Network	6	59		x	
Floating Islands Lagoon Reserve	2	84			x
Lake Elizabeth area	1	1,300			x
Lake Bullenmerri and catchment	1	488			x
Lake Gnotuk and catchment	1	208			x
Western district lakes system	-	30,000			x
Total	98	80,999	11	24	17

Source: Environment Australia (2001) and DCNR (1995).

Regionally significant wetlands

Additional sites considered to be of regional significance and requiring further evaluation of their suitability for inclusion in the DIWA, have also been identified through a variety of projects including:

- the National Land and Water Resources Audit (NRE 2002);
- the Wetland Resource Assessment Package developed for the 'Conservation Values of Lakes and Wetlands in the South-western Region, Victoria' report (ABRG 1988); and
- the Corangamite Wetlands Inventory (CEM 2005).

As part of the **National Land and Water Resources Audit** (NLWRA) in 2002, a national framework for identifying biodiversity assets (including wetlands) of bioregional significance was established. DSE undertook a desktop assessment of existing wetland data, with no field validation, leaving extensive gaps in the assessment. Where criteria could not be assessed with existing data they were not addressed (criteria for assessment are outlined in Appendix 6). The application of these criteria to the Corangamite region resulted in the identification of 355 wetlands (see Figure 7 in section 2.3.1).

The **Wetland Resource Assessment Package** (WRAP) developed for the Australian Biological Resource Group (1989) report identified 340 significant wetlands within the region based on the following criteria: rarity/degree of endangerment of species; rarity of wetland type; wetland size; importance for water birds; naturalness; scientific value; and heritage value (related to natural values).

The **Corangamite Wetland Inventory** (CEM 2005) identified 34 wetlands with high environmental values from the 101 sites surveyed across five sub catchments (Salt Creek, Dereel, Kooraweera Lakes, Warrambine Creek and Connewarre). This was based on a Total Rapid Assessment Score generated by summing rapid assessment variables [condition of: water dependant fauna (aquatic invertebrates, fish, and water dependant birds); aquatic vegetation; and riparian vegetation (shore, bank and buffer)], and the subjective condition value (ratings included: pristine; intact; moderate; degraded; or severely degraded). This rapid assessment score provided a quick means of assessing the environmental attributes of wetlands based on survey parameters. Wetlands were grouped into three classes: low, moderate, and high wetland values, based on this score.

Many other significant wetlands are referred to within the literature. Relevant literature will be carefully reviewed and considered in the action-planning phase to follow Strategy development.

2.3.3 Regional Wetland Threats

A strategic risk assessment based on the broad concepts and principles of ecological risk assessment was undertaken to assist Strategy development, via the coordination of three regional wetland risk assessment workshops in March 2005 (in Colac, Geelong and Ballarat). This systematic and strategic analysis of risk provided necessary information to Strategy developers and facilitated priority setting, resource allocation, and informed decision-making. This approach also facilitated an understanding of the relationship between specific threats and values, and the complexity inherent in designing wetland management programs (see Appendix 1 for a list of organisations represented at these workshops).

The strategic risk assessment framework drew on the approach set out in the Australian Standard for Risk Management, AS/NZS 4360 (SA/SNZ 2000). Threat scenarios were brainstormed and documented prior to workshop commencement. These were generated from the lists of assets and threats included in the 'Policy Framework for Wetlands in Victoria' (DSE 2003) (see Sheldon 2005 for more information on the wetland risk assessment workshops).

Table 9 provides a summary of the risk ratings obtained from collated workshop data. Inappropriate resource use, poor waste management, urbanisation, pest plants and animals, and climate change were regarded as the primary threatening processes affecting regional wetlands.

Table 9 Summary of risk ratings based on threats

Threat	Risk rating			
	L %	M %	H %	E %*
Physical change	17	17	17	50
Inappropriate resource use				100
Poor waste management			50	50
Water storage regulation/extraction		20	20	60
Urbanisation			25	75
Pest plants and animals			66	34
Recreational impacts		50	50	
Climate change			50	50

* Note: L = Low Risk, M = Moderate Risk, H = High Risk and E = Extreme Risk

Another outcome from the wetland risk assessment workshops was that overall risk to environmental assets was perceived to be greater than that to social and economic assets (Table 10). A potential explanation for this finding was that participants did not feel comfortable in ranking risk in relation to these types of wetland assets, perhaps due to a lack of knowledge and awareness.

However it is also possible that in fact the greatest level of risk to wetlands is associated with environmental assets of these systems. Increased public promotion of the social and economic aspects of regional wetlands will occur as part of Strategy implementation (section 3.4).

Table 10 Summary of risk ratings based on triple bottom line factors

Triple bottom line factor	Risk rating			
	L%	M %	H %	E %*
Environmental			20	80
Social		7	43	50
Economic	7	21	43	29

* Note: L = Low Risk, M = Moderate Risk, H = High Risk and E = Extreme Risk

There appears to be adequate knowledge of the range of threats to wetlands within the Corangamite region, particularly with regard to larger, and significantly listed, water bodies. Grazing, increasing salinity, water regulation, pollution and eutrophication were common threats recorded at listed wetlands within the region (ANCA 1996). However, there is insufficient data on the majority of wetlands to identify the extent of threats and impacts to the overall integrity of different wetland types within the region. A brief overview of major threats associated with the region's wetlands is provided below under the headings of threat categories used in the risk assessment process.

Physical change

There is evidence of change in wetland area and ecological character within the region (Corrick 1982). Remnant wetlands on private land often persist in a degraded form, from past land clearing and/or partial drainage. These continue to be drained or filled in when urban development occurs, or when rural land that is waterlogged is used for more intensive agricultural production. The conversion of the catchment to agricultural and urban land use, with high and rapid runoff, has also changed the volumes, timing and frequency of flows to wetlands, altered their wetting and drying cycles, and biophysical and chemical compositions.

Codd (1992) identified drainage as the key threatening process to shallow freshwater wetlands of the Corangamite region and Corrick (1982) stated that the loss of these and other wetland types has had a detrimental effect on waterbird populations. Extensive areas of freshwater meadows and marshes that have been drained would have originally supported substantial seasonal populations of waterbirds. The loss of these original wetlands has contributed to the local disappearance and endangerment of some species (Codd 1992). Species most affected would presumably be those restricted to freshwater habitats (e.g. Latham's Snipe, Purple Swamphen, Crakes, Dusky Moorhen and Whiskered Tern), and particularly those that rely on such categories for breeding habitat (e.g. Brolga, Australasian Bittern and Black-winged Stilt) (Corrick 1982; Harding 2001).

Secondary salinisation as a result of extensive tree clearing affects the Corangamite Basin by increasing the salinity of surface and groundwater entering the region's lakes and wetlands (ACIL Australia 1983; Nicholson *et al*. 1992; Williams 2001). The extent of impacts to wetlands through secondary salinisation is currently unknown. Salinisation appears to be most threatening to lakes and wetlands that are naturally saline to some degree, where the threat is increased salinity to a level where the biological values of the lake are compromised. The Arthur Rylah Institute for Environmental Research is currently undertaking a study, which aims to investigate the ecological impacts of increased salinity on wetland systems, as a result of human induced salinity and management actions.

Public education of the importance of wetlands, and a range of incentives to preserve wetlands on private land, are measures likely to have an impact on the rate of drainage in the region. These are major objectives and actions included in this Strategy (see objective hierarchy, Appendix 9).

Inappropriate resource use

Grazing is the primary and historical land use of the region and was the most frequently recorded threatening process at significant wetlands (CEM 2005). Grazing by livestock can be a significant threat to the maintenance of wetland values (Hull 1993) and is generally not compatible with conservation objectives. Livestock grazing directly causes a reduction in vegetation cover through foraging and physical damage. This creates localised areas of disturbance that can lead to significant changes in the composition of vegetation communities, including weed invasion (Hull 1993). Livestock also eat and trample rare and threatened wetland plants and degrade habitat for rare and threatened fauna (Hull 1993). Many of the region's wetlands remain unfenced and are grazed by domestic stock. Up to 90% of the Western District Lakes shorelines are grazed to the water's edge (DNRE 2002e).

Threatening Processes - Grazing of Wetland Sites can lead to Pugging.

The interaction between grazing and wetland values in the region is complex and not well documented. Stock access to water has also contributed to increased turbidity, reduced oxygen levels and increased nutrient levels. However, the contribution of grazing to reduced water quality, as compared to other factors, such as catchment inputs, is poorly understood (DNRE 2002c). Strategically managed grazing may contribute to the maintenance of certain wetland threats, e.g. weed control. However, further research is required to determine the approach to grazing management best suited to the maintenance and enhancement of the ecological character of regional wetlands. Research in southwest Victoria is investigating these relationships further with the goal of providing best practice management for wetland grazing in the future, i.e. Ecorich Grazing Trials and the Ecologically Sustainable Agricultural Initiative Project.

Poor waste management

Declining water quality can arise from the following pollutants: salt, nutrients (phosphorous and nitrogen) and organic matter, sediment (increasing turbidity) and toxicants (biocides, heavy metals). These pollutants can reach wetlands from surrounding agricultural land via waterways or overland flow, and from point sources. An excess of nutrients results in high levels of biological activity including blue-green algae blooms, loss of biodiversity and deteriorating water quality.

Algal blooms pose a number of problems and they degrade the aesthetic appeal and recreational value of lakes. Some produce toxins that can have serious health implications for recreational users, native fauna and livestock, contacting or drinking contaminated water. Algal blooms have been recorded as a threat to Lakes Colongulac, Colac, Murdeduke, Milangil, and Corangamite (Williams 1992; Environment Australia 2001). The Corangamite Nutrient Management Working Group estimated an annual loss of $6 - $9 million due to the impact of algal blooms in the region. With continuing expansion of urban and agricultural development, it is anticipated that the incidence and severity of algal blooms in these lakes will continue unless carefully managed (CCMA 2000).

Eutrophication is primarily a threat to larger water bodies within the Corangamite region that are currently receiving sewage and other nutrient rich pollutants. Land uses that result in high nutrient loads include: cropping, horticulture, dry land grazing, and urban development. Serious eutrophication of a water body can be difficult to reverse. The effects of eutrophication have caused eel deaths at Lake Colongulac (Bookaar Eel Culture Pty. Ltd. 1983).

Dumping of rubbish along shorelines poses another source for pollution. Wastes include a wide range of household, agricultural and municipal refuse such as packaging, stock carcasses and car tyres.

The extent of water quality issues in wetlands throughout the region is poorly known with the exception of most publicly owned lakes. However, impacts associated with pollution are being addressed through a range of measures including fencing and revegetation of waterways within the Corangamite Basin, and implementation of the Corangamite Region Nutrient Management Plan. The encouragement of industry best practice management in regard to waste discharge into lakes and wetlands, on both public and private land, would contribute to improved water quality and is an action outlined in the strategic investment plan (chapter 3).

Water storage regulation/extraction

Water diversion and regulation schemes have altered the natural water regimes of many lakes within the Corangamite region including most of the nine lakes that form the Western District Lakes Ramsar Site. The impact of these changes has been most evident at Lake Corangamite where water levels have fallen, salinity has risen, and the composition of the biota has changed (Williams 1995; DNRE 2002e). Increased salinity in Lake Corangamite and Cundare Pool has resulted in decreased numbers of visiting water birds (CEM 2005).

A primary example of water manipulation is the Woady Yaloak diversion scheme, constructed in 1959 to relieve flooding of agricultural land from Lake Corangamite during a period of high rainfall in the early 1950's (DSE 2002e; Williams 1995). The lakes largest tributary, the Woady Yaloak River, was diverted via an earthen channel and the Warrambine Creek, into the Barwon River in order to maintain a lowered lake level, and minimise the chance of flooding (DSE 2002e). The scheme has significantly

reduced the water level of the lake, which has in turn caused salinity levels to rise. The changes have been most profound since 1980, where salinity levels have doubled and water levels have fallen by nearly two metres, eliminating islands that formerly served to protect nesting and roosting waterbirds from terrestrial predators (Williams 1995). Corangamite CMA inherited the scheme in 1998 and currently manages/maintains it in accordance with guidelines, which have the goal of diverting as much of the Woady Yaloak River's flood flows down the diversion channel within allowable salinity limits. A review of this and other regional drainage schemes (*i.e.* the Lough Calvert scheme) is currently being undertaken with the aim to determine the best management plan for operation of the schemes over the next 10 - 20 year time frame (CCMA 2004). An important consideration in the development of this plan is the Corangamite CMA's obligation to protect the Western District Lakes Ramsar site's ecological character under the Convention.

Water regimes have been altered in the Barwon River catchment, particularly with respect to increased water extraction. Flows down the Barwon and Moorabool Rivers are important to the health of Lake Connewarre and associated wetlands, and to the availability of water for regulating levels in Reedy Lake (DNRE 2003). The impacts of altered flows on the marine environment of Port Phillip Bay are not well documented (DNRE 2003).

Other hydrological modifications that have affected water regimes within lakes and wetlands of the Corangamite region include the following (DNRE 2002e; 2003):

- artificially lowered outlets as a result of drainage works and accelerated soil erosion;
- modification of infrastructure – e.g. raised banks of an adjacent public road has increased the height and duration of flood events in Lake Milangil and retarded natural water flow between other lakes;
- clearing of surrounding land for agricultural production has increased surface water runoff in some areas, contributing to high water levels (LBCPSC 1998), and increased sediment loads/levels of nutrients which enter a number of wetlands;
- increased number of farm dams within the landscape lowers the available water run-off from local catchments that would under normal circumstances flow into and between wetlands; and
- level of extraction potentially effecting base flow to wetlands.

Urbanisation

Residential development is currently threatening wetlands close to existing developments. These include Ramsar wetlands near Lara and on the Bellarine Peninsula, where housing expansion and further development has the potential to negatively impact on these sites (DNRE 2002e). Future development of Ramsar areas must consider the conservation and wise use objectives that are an obligation under the Ramsar Convention. The protection of areas surrounding significant wetlands is essential in providing valuable buffer zones that contribute to the protection of high value wetland areas.

Potential impacts from residential and commercial development in the area include urban runoff, stormwater quality, and the risk of wandering domestic animals impacting on the site (DNRE 2002e). This is being addressed through education of both the public and private industry, and treatment solutions, such as gross pollutant traps.

Victoria is about to experience major changes in population growth, which will vary geographically. Regional Victoria is projected to grow by 350,000 people by 2031 (DSE 2004). Strong population growth is projected for the Corangamite region and is likely to be concentrated in the following areas: close to Melbourne, within the Geelong to Ballarat corridor, and coastal areas proximal to Geelong.

The enhancement of wetland protection through planning is a key activity outlined in this Strategy. This will involve amendments to existing planning scheme overlays and planning guidelines for Local Government areas. These activities are currently being piloted within the City of Greater Geelong municipality via the Geelong Regional Wetlands Project (see section 2.4). Improved planning is an

important step in improving wetland protection in the short term, especially in peri-urban areas with continued and rapid development.

Pest plants and animals

Weed species threaten wetland ecosystems primarily by the displacement of native shoreline vegetation (Platt & Corrick 1994). A total of 149 environmental weeds of herb-dominated freshwater wetlands, and 42 of shrub-dominated freshwater wetlands have been identified in Victoria (Carr *et al.* 1992). A significant proportion (39%) of flora species recorded within wetlands of the Corangamite region, have been identified as exotics or environmental weeds (CEM 2005). The large percentage of exotic species recorded on wetlands reflects the degraded nature of regional wetlands to the point where some shallow wetlands have been reduced to little more than flooded pasture grasses (ABRG 1988). In the Corangamite region, some introduced pasture species including Tall Wheat Grass (*Lophopyrum ponticum*), Canary Grass (*Phalaris* spp.) and Sweet Vernal-grass (*Anthoxanthum odoratum*) have been identified as threats to the Western District Lakes (DNRE 2002e). Spiny Rush (*Juncus acuta*), Cord Grass (*Spartina* spp.) and Box-thorn (*Lycium* spp.) were identified as the most significant threats to conservation values at the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site (DNRE 2003).

Tall Wheat Grass on the edge of Middle Lough Calvert

Exotic flora species can provide harbour for pest animals including foxes, feral cats, rabbits and introduced birds that prey upon, or compete with, native fauna for food and habitat. The introduced Carp, which has been recorded in permanent lakes within the Corangamite region, is thought to impact on native fish diversity and to contribute to water quality problems (Williams 1992).The impacts of foxes and cats on wetlands within the Corangamite region has not been documented, however they likely prey upon a range of wetland-associated small mammal, bird and reptile species (DNRE 2002e). Predation of native wildlife by foxes and cats are listed as threatening processes under the *Flora and Fauna Guarantee Act 1988*.

Recreational impacts

Recreational activities including duck hunting, fishing, boating and trail-bike riding, have been identified as threatening processes to some wetlands and lakes within the Corangamite region (Environment Australia 2001). Recreational damage is primarily a threat to the larger, deeper and publicly owned wetlands and lakes. Privately owned wetlands were not noted to be greatly affected by recreational activity during the Corangamite Wetland Inventory (CEM 2005).

Duck hunting is a permitted activity under the *Wildlife (Game) Regulations 1990* and occurs annually at many of Corangamite's larger lakes. The impacts of duck hunting on site values have not been determined, however, hunting can create both physical and noise disturbance to fauna and result in the accidental shooting of protected species. Contamination of wetlands from the accumulation of lead shot was considered an environmental risk. Both publicly owned wetlands open to duck hunting and privately owned wetlands where landholders allow access to hunters, were at risk of lead contamination to varying degrees (DNRE 2002e). Wetlands most at risk of excessive lead deposition were those most popular with hunters – Lakes Corangamite, Murdeduke, Gnarpurt, and Colongulac.

However, as waterbirds are generally highly mobile species, the affects of lead poisoning have not been confined to contaminated wetlands. The use of toxic lead shot (with some minor exemptions) has been prohibited in Victoria since 2002 (DNRE 2002e).

Recreational fishing can lead to localised problems associated with litter, fires, discarded fishing line entangling water birds, human waste, and disturbance to shoreline vegetation. Recreational fishing activity may also disturb water birds particularly near feeding, roosting and nesting sites, as well as influencing the behaviour and habitat utilisation of the Corangamite Water Skink (Robertson and Peterson 2002).

Impacts associated with recreation are being addressed through a range of measures.

Vehicle Damage, Lake Corangamite

These include:

- seasonal closure to hunting of areas near water bird colonies at designated lakes;
- closure of other lakes if significant populations of other species are present;
- significant enforcement and monitoring presence during duck season;
- enforcement of fishing regulations dealing with fish size and catch limits; and
- the development of visitor interpretation and education programs.

Climate change

The extent of potential effects of climate change on Corangamite wetlands is largely unknown, although continual drying and increased salinity over time is expected. Climate change is also likely to affect wetlands through changes in; rainfall and temperature patterns, sea level changes and storm surges, and increased evaporation (DSE 2003).

Potential impacts of climate change on wetlands are based on studies which assess the effects of climate variability on natural water regimes and wetland plant communities. Proposed effects generally involve the replacement of original wetland species with other types of wetland species and/or succession of natural wetland types to surrounding terrestrial systems (Ramsar Convention Bureau 2002).

A number of direct impacts of climate change on species and ecosystems may include:

- reductions in the geographic range of species; changes to the timing of species life cycles;
- changes in population dynamics and survival;
- changes in the location of species habitats;
- increased risk of extinction for species which are already threatened;
- increased opportunity for range expansion of invasive species;
- changes in the structure and composition of ecosystems and communities; and
- changes in coastal and estuarine habitat due to rising sea levels (NRMMC 2004).

2.4 Current Activities

There is currently a suite of wetland associated activities occurring within the Corangamite region. A brief summary follows of some of the activities at the time of writing.

At the State scale, the Victorian CMA Wetlands Network (consists of CMA/Melbourne Water Authority wetland managers and DSE senior policy staff) is collaborating to ensure the consistent development of regional wetlands strategies, investment frameworks and information systems. DSE senior policy staff have also recently developed an Index of Wetland Condition (IWC) which is intended to become the standard measure of wetland condition for the State. This Index will be trialled over 2006/2007 by regional CMA's, prior to statewide implementation.

Regionally, activities include long-term, ongoing projects such as:

- The *Borrell-a-kandelop* project (a collaborative effort between Greening Australia Victoria, Parks Victoria and the Corangamite CMA - devoted to the protection, rehabilitation and sustainable management of inland wetlands within and adjoining the internationally significant Western District Lakes Ramsar site); and

- The Geelong Region Wetlands Project (a project which aims to bring community groups, landholders, local government and State Government agencies together in an integrated project to provide education and awareness, protection and management of wetlands in the Geelong region).

New projects include:

- A CCMA Wetlands Tender Pilot;

- A CCMA funded CSIRO project which attempts to define the processes causing salinity of the groundwater dependant ecosystems in the Corangamite region;

- Continued wetland mapping/inventory projects; and

- Coordination of awareness raising events, *i.e.* World Wetlands Day, and development of community education products.

For more details on the CCMA Wetlands Program and current projects please refer to the CCMA website: www.ccma.vic.gov.au.

Brolgas on Lake Connewarre

3 STRATEGIC FRAMEWORK

This chapter details the strategic framework for regional wetland investment and includes the vision, principles and objectives developed to direct investment. Outputs and activities for achieving Strategy objectives are presented in a summarised logistic framework (strategic investment plan) and investment options for Strategy implementation are discussed. A monitoring and evaluation section follows the strategic investment plan and the final section of the chapter includes a brief scope of future wetland action plan development and the prioritisation framework for regional wetlands.

3.1 Vision

The Corangamite CMA has adopted the following vision for wetlands within the region:

'Maintain the extent and enhance the quality of Corangamite wetlands through a community inspired to wisely use and conserve these assets.'

This vision reflects the objectives for wetland investment outlined in the Regional Catchment Strategy (CCMA 2003), Victoria's Biodiversity Strategy (DNRE 1997), and the Victorian River Health Strategy (DNRE 2002b). This vision will be achieved through the development of strong partnerships between government, land managers and landholders. Actions aimed at increasing the awareness of wetland benefits and the capacity of landholders to undertake conservation services will also support achievement of this vision (see objectives for vision achievement in section 3.3).

Fenced Wetland - Volcanic Plains

3.2 Principles for Strategy Development

Principles help to define future directions and determine priorities for strategic direction. A prioritised, agreed and understood order of direction will ensure that available resources are allocated to activities that will lead to long-term gains.

To achieve the vision for wetlands in the region, it is proposed that principles be used in guiding strategic decisions and activities at a regional scale. The following principles are derived from the

'Policy Framework for Wetlands in Victoria' (DSE 2003) and will underpin the strategic direction for wetland investment in the region.

- Land managers, planners and the wider community should recognise that wetlands, through their ecological and hydrological processes, provide valuable services, products and benefits that are enjoyed by and sustain human populations.
- All wetlands need to be managed wisely to ensure they continue to provide ecological and hydrological functions and services for future generations as well as to conserve biological diversity.
- Ramsar sites must be managed to maintain their ecological character, a national obligation as signatory to the Ramsar Convention.
- Formulation and implementation of planning should promote the conservation and wise use of all wetlands.
- Appropriate measures should be taken to preserve and enhance the environment of migratory birds, particularly those listed under international agreements.
- Effort should be made to raise community awareness of the value, benefits and range of wetland types in an effort to conserve Australia's wetlands through the promotion of their ecological, cultural, economic and social values.
- Land managers and planners have a key role in ensuring that State legislation and policies that relate to wetlands are implemented and that Victoria contributes to meeting Australia's international commitments in relation to the management of wetlands.
- The protection of wetland habitat is vital to conserve the many species of native flora, fauna and ecological communities that depend on wetlands, including threatened species.
- Investment on private land leads to public gain and land managers should be supported to undertake conservation services on their land beyond accepted duty of care.

Another set of principles will be used to guide prioritisation and investment in the development of wetlands action plans. Such principles will be derived from those developed by the Victorian CMA Wetlands Network, and those which guide on ground investment for the Corangamite Native Vegetation Plan (CCMA 2005a) and River Health Strategy (CCMA 2005b).

3.3 Objectives

The aim of this strategic framework is to facilitate the maintenance and enhancement of condition of regional wetlands through a broad range of mechanisms. The objectives, outcomes and activities outlined in this Strategy will provide the foundation for achieving the vision for regional wetlands. Further prioritised actions, specific to sub-regions and on ground works, will be scoped through the development of action plans in 2006 and beyond.

The objectives listed below are not presented in hierarchical order and important links exist between them, particularly those involving 'improved wetland management' and 'increased public awareness of wetland benefits'. In many instances increased awareness (facilitated by the development of community education products and provision of learning opportunities) is an essential first step in enabling land managers to manage for conservation and gaining long-term improvements in wetland condition. It should also be noted that many activities could have been included under multiple objective and output headings.

Key objectives required to achieve the Strategy's vision include:

- improved wetland management;
- increased public awareness of wetland benefits;
- prioritisation of regional wetlands; and
- effective Strategy implementation.

3.4 Strategic Investment Plan

The strategic investment plan consists of an objective hierarchy and a description of the necessary implementation arrangements and resources needed to achieve the specified goal. This is based on the logical framework approach and strategic objectives (Figure 9). These objectives are summarised as a hierarchy in a 'log-frame matrix' (Appendix 10). This is a management tool that requires occasional adjustment upon review to reflect current contexts and changing needs.

The objective hierarchy describes how lower level activities contribute to higher-level outputs and how these, in turn, help to achieve overall project objectives and ultimate vision (see Appendix 9 for simplified outline of objective hierarchy).

The log frame summarises:

- what the Strategy should achieve, from the level of an overall goal down to specific activities;
- the performance questions and indicators that will be used to monitor progress and overall achievement;
- how the indicators will be monitored or where the data can be found; and
- the assumptions behind the logic of how activities will eventually contribute to the goal, plus associated risks for the project if assumptions turn out to be incorrect.

An **assumption** is any condition outside the direct control of the project that is important for the project to succeed. There are two types of assumptions: external factors and those relating to the internal cause-effect logic (see Appendix 10).

Migratory Wader Birds

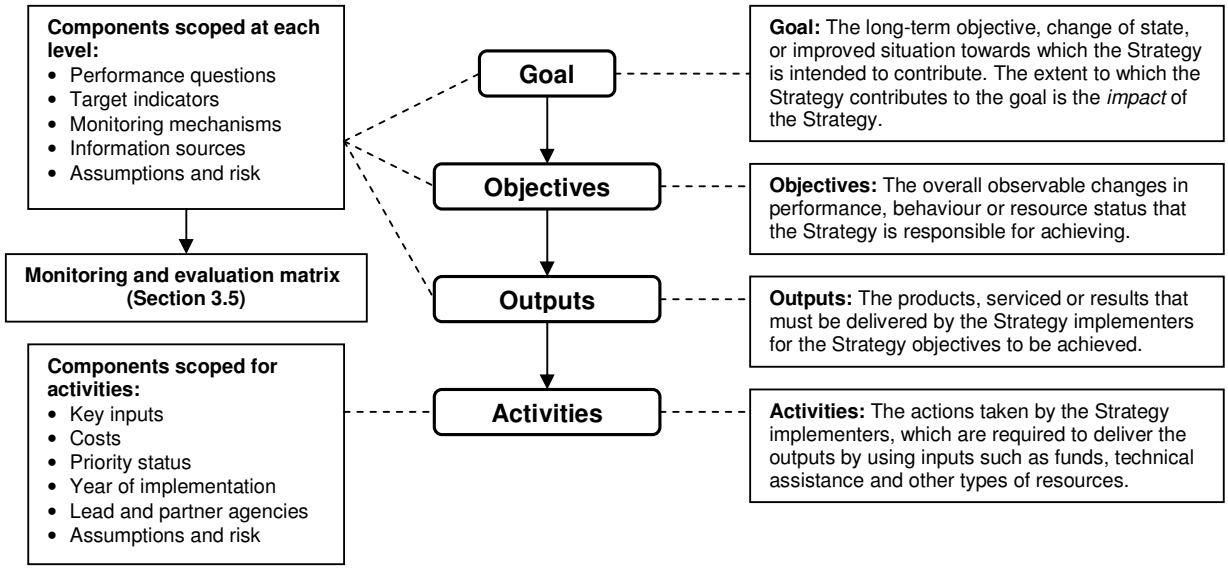


Figure 9 Explanation of the objective hierarchy and log-frame components

This investment plan will remain flexible for the inclusion of relevant information as actions are implemented and objectives are achieved. The plan will provide the basis for strategic investment in the Corangamite CMA wetlands program for the next five years and will be reviewed and updated accordingly in conjunction with the RCS and other sub-strategy reviews. As fore mentioned, the complete objective hierarchy and log-frame matrix are included in Appendices 9 and 10.

Table 11 provides a simplified summary of the activities and investment components of the log-frame which are needed to implement the Strategy and achieve the region's goal for wetland assets. More detailed information on activities and key resource requirements (including costings) for their implementation is included in Appendix 10.

Costs included in the investment plan are indicative only and Strategy implementers acknowledge that funding limitations exist (funding mechanisms for Strategy implementation are discussed in section 3.4.1). The Strategic Investment Plan is practicable although not necessarily achievable given present funding opportunities and resource availability. It is unlikely that the total resource allocation required to implement every element of the investment plan will be received over the next five years. It is due to this fact that activities have been prioritised on an annual basis according to: actions deemed integral to the effective achievement of the Strategy's vision; and those which are required in combination with another to achieve an objective (*i.e.* activities which have follow on effects and those which are related to others).

Table 11 Summary of the strategic investment plan/logistic framework

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
Improve wetland management	Appropriate management determined and undertaken	*Establish and address R&D priorities. Incorporate in CCMA R&D Strategy and annual priority investment plan*						**CCMA**	100	
		Implement existing management plans, i.e. Ramsar Site Plans, relevant Threatened Species Recovery Plans						**DSE** Parks Victoria (PV), CCMA, Water Authorities, Greening Australia Victoria (GAV), others	100	
		Develop and/or update plans for Ramsar and DIWA sites						**CCMA** DSE	N/A	
		Initiate wetland reserve schemes for inclusion as part of the National Comprehensive Adequate and Representative (CAR) Reserve system.						**DSE**	100	
		Nominate sites for significance listing						**CCMA, DSE**	10	
		Increase conservation security, i.e. covenants and conservation agreements						**Trust for Nature (TFN), DSE** CCMA, Local Govt	N/A	

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
	Land managers enabled to manage for conservation	*Design and implement a range of incentive schemes (i.e. MBI's, tax breaks, rate rebates, grants)* **Note: Costs provided are for design only and do not include incentive payments.**						**CCMA** DSE, Local Govt, GAV, Landcare	85	Costing is for design, management and administration of incentive schemes - does not include incentive payments (included in activity below).
		Provide assistance and support to land managers (via grants, rebates and incentive schemes)						**CCMA** Local Govt, GAV	1,225	A range of wetland incentive schemes are currently in operation within the catchment, namely BAK, Geelong Regional Wetlands Project and PlainsTender. CCMA has received funding for 2005/06 through to 2007/08 to support implementation of a WetlandsTender project.
		Support EBMP and whole farm planning						**CCMA** Department of Primary Industries (DPI)	N/A	
		Create opportunities to learn, i.e. field days, seminars						**CCMA, GAV**	25	
		Prepare BMP guidelines and tools to facilitate wetland management *Facilitate dissemination of information to landholders*						**CCMA**	5	

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
		Develop and market decision making frameworks for new projects						**CCMA** Govt agencies, Southern Farming Systems, Gain and Graze, etc.	N/A	CCMA and GHCMA are currently working with DPI and SFS to develop decision-making frameworks for the expansion of raised-bed cropping agricultural practice in southwest Victoria.
	Capacity of CCMA, Department and industry staff to support landholders strengthened	*Train field officers in the assessment of wetland systems and negotiation of conservation services with landholders*						**CCMA** PV, DSE, GAV	5	
		Integrate with key projects in the region						**CCMA** PV, DSE, DPI, GAV, Local Govt, Landcare	N/A	
		Identify and communicate enforcement capacity and roles and responsibilities of relevant authorities						**CCMA** Environmental Protection Agency (EPA), Water authorities, Local Govt, DPI	5	Review of legislation and policy will be completed in year 1 and incorporated into information products/seminars in year 2.

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
		Bring stakeholders together and strengthen partnerships (cultural heritage)						**CCMA** PV, DSE, DPI, GAV, Local Govt, Aboriginal groups and Cultural Heritage Officers	3	
		Lessons learned/case studies developed, i.e. information notes						**CCMA**	5	
		Re-establish environmental flows/natural water regimes for wetland assets as part of the broader CCMA responsibility						**CCMA** DSE, Water Authorities	N/A	
	Improved planning and compliance with relevant legislation/best management practice	*Promote ISO 14001/best practice within industry currently impacting on wetland assets*						**CCMA** Local Govt, EPA, DSE	10	The Geelong Regional Wetlands Project is currently promoting best practice with industry adjacent to Jerringot wetland.
		Mandatory Environmental Management Plans for urban development and Water Sensitive Urban Design						**CCMA** Local Govt	N/A	
		Promote awareness of existing legislation and duty of care						**CCMA**	10	
		Improve Local Govt planning scheme overlays for wetland protection						**CCMA** Local Govt	90	City of Greater Geelong is currently amending planning schemes as part of the Geelong Regional Wetlands Project.

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
Increase public awareness of wetland benefits	Awareness of wetlands increased	*Community education plan*						**CCMA**	N/A	
		School education packages (primary and secondary)						**CCMA** GAV, Local Govt	10	Coordination with existing programs will occur throughout years 1-5.
		Two annual wetland awareness raising events						**CCMA** Local Govt, GAV, PV, DSE, DPI, Landcare	25	
		Develop extension materials on wetlands						**CCMA, GAV**	6	
		Displays/presentations at field days						**CCMA**	2.5	Displays developed in Year 2 and then displayed in years thereafter.
		Promote wetlands through tourism						**CCMA** Tourism Assocs, Local Govt	4	Coordination with tourism partners will be conducted each year, with the development of tour brochures as a focus in Year 3.
		Regular media representation of wetland projects						**CCMA** DPI, Local Govt, PV, DSE, GAV	N/A	

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
Prioritisation of regional wetlands	Increased wetland information	*Revision of wetland information system (current inventory database) to enable prioritisation and risk assessment capabilities*						**CCMA**	30	Funding has been acquired in 2005/06 to support implementation of this activity. Victorian CMA wetland managers are collaborating to develop a state-wide Wetlands Information System.
		Review existing data and identify gaps						**CCMA**	N/A	
		Tools developed for assessment procedures						**CCMA**	20	Funding has been acquired in 2005/06 to support implementation of this activity.
		Inventory of sub-regional wetlands (rolling)						**CCMA**	20	$20K is for a report at the end of Year 5. Ongoing wetland inventory will be conducted in conjunction with Tender and IWC projects.
		Conduct a condition assessment of representative wetlands (in field)						**CCMA**	10	$10k is for a report at the end of Year 2. Funding has been acquired in 2005/06 to support implementation of this activity.
		Scope feasibility of remote sensing application to assess wetland condition/monitor wetlands						**CCMA** Monash University	N/A	
		Inclusion of recent wetland and regionally specific literature in CCMA R&D database						**CCMA**	N/A	

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
		Finalise fine scale mapping and wet and dry extent mapping						**CCMA** Consultant	20	
		Support research that increases information on assets/threats						**CCMA** Research Institutions and Govt Agencies, GAV	N/A	
	Action Plans developed	*Prioritise wetlands for investment at the sub-regional scale*						**CCMA**	2	
		Conduct risk assessment on priority wetlands						**CCMA**	30	
		Develop and implement Action Plans						**CCMA**	50	Pilot Landscape Zone Plan will be developed in 2005/06. Others will follow dependent on success of the pilot.
		Review and update Action Plans in conjunction with Landscape Zone Plans						**CCMA**	N/A	
Effective CWS implementation	Project staff and partners working as a committed team	*Identify and engage agencies responsible for project delivery and approx. project costs*						**CCMA**	700	Costs to support employment of key staff – Wetland Coordinator and Wetlands Officer. Funding has been acquired in 2005/06 to support implementation of this activity.
		Funding sources and implementation tools for wetland projects identified and accessed						**CCMA**	N/A	

Objectives	Outputs	Activities	Priority status* and year of Implementation					Responsibility	^Cost ($000's)	Comments
			1	2	3	4	5			
	Planning and M&E systems operational	*Design M&E system*						**CCMA**	N/A	
		Conduct Strategy review						**CCMA**	1	
		Conduct regular monitoring and evaluation						**CCMA**	5	
		Report to CCMA as required						**CCMA**	N/A	

* Priority status legend: High
Medium
Low

^ Costs are preliminary estimates only and indicate total cost for all years where activity is to be implemented. Unless otherwise indicated, costings indicate predicted additional requirements to current resources, not total resources required.

3.4.1 Funding Mechanisms for Strategy Implementation

As detailed above in Table 11, an approximate funding total of $2,753,500 is required over the next 5 years to facilitate Strategy implementation. Funding for the implementation of certain activities and projects outlined in the investment plan (namely Wetlands Tender, Index of Wetland Condition, Wetland Coordinator, Wetland Officer, Geelong Regional Wetlands Project, Borrell-a-kandelop and the implementation of some threatened species Recovery Plans) has been secured through the 05/06 Regional Catchment Investment Plan (RCIP) for the next one to three years.

The RCIP targets State and Australian Government funds primarily made available through the National Action Plan for Salinity and Water Quality (NAP) and Natural Heritage Trust (NHT) programs. Beyond the financial year 2007/08 the major source of funding for wetland projects is as yet unclear. Alignment of this Strategy and wetland action plans with the Corangamite RHS will maximise the opportunity for integration of wetland projects with River Health projects and hence best position wetland projects for funding through river health programs which currently have security beyond 2008. Also a key action of the Strategy is to assess opportunities for private investment, *i.e.* Philanthropic Trusts, which has been scarce to date, but may prove vital in future years with the phase out of current major government funding programs.

For updated information on relevant funding programs which can potentially be targeted to support Strategy implementation, please refer to the CCMA website: www.ccma.vic.gov.au and the seasonal CCMA funding newsletter which is also posted on the website.

3.5 Monitoring and Evaluation

The main purpose of monitoring and evaluating the Strategy is to provide information necessary for impact-oriented management. The monitoring and evaluation plan (Appendix 11) will support staff in ensuring compliance with the Strategy and it will improve responsiveness, efficiency and effectiveness by provision of constant feedback to program planners and implementers. Monitoring and evaluation will also contribute to stakeholder learning via the promotion of dialogue, and this system will provide regular reporting to stakeholders and investors in a form relevant to their needs.

The monitoring and evaluation plan is directly linked to the logistic framework presented in Appendix 10. It scopes in detail the tools available and/or required to monitor achievement of Strategy targets.

Mimulus repens, (Creeping Monkey-flower)

3.6 Limitations for Prioritisation

Establishing priorities for investment in planning and management measures to protect and enhance wetlands is complex. A lack of biological data exists for 98% of Corangamite's mapped wetlands (ABRG 1988). Present wetlands inventory data is limited in scope, classification accuracy and information on threats and values of wetlands. Gaps within wetlands data for Corangamite are extensive and thus the capacity of land managers and funding bodies to make decisions about priorities for the allocation of resources to wetland management and conservation has been restricted by the lack of basic data sets for the majority of regional wetlands.

Current investment in the Corangamite region uses best management practices as a basis as well as the existing data sets for priority setting. An increased understanding of how resources can efficiently be allocated to achieve the best results is however essential for effective wetland conservation in the longer term. This requires the establishment of transparent and highly defensible priorities for the allocation of funds, personnel and community efforts.

To this end, the preparation of this Strategy has involved the establishment of strategic and whole of region activities for investment. The future action-planning phase will attempt to prioritise wetlands and scope site or sub-region specific activities at the landscape zone scale. Currently a wetland information management system, titled the 'Corangamite Wetlands Inventory' exists. As a result of Strategy implementation it is hoped that this database will be revised to include IWC data and be developed to enable and support wetland prioritisation, using a risk assessment methodology to be established in the database.

There are likely to be significant data gaps, particularly in the area of economic and social values of wetlands. Therefore, several regional workshops have been proposed to coincide with the development of wetland action plans in an attempt to capture this information from regional stakeholders and communities.

Filling data gaps is a regional priority to enable more effective allocation of resources to wetland protection and management. As more geographically precise information is gathered and added to the system, it will be possible to compare values and threats across the region for each wetland and enable a full prioritisation to be run in the database in future.

Information and actions outlined in existing plans and review reports are being used to guide investment and a wealth of information on regional wetlands exists within literature. On-ground action has focused on Ramsar sites and other sites of significance. General, ongoing programs listed in section 2.4 have a proven track record and developed capacity. These continue to provide important support for wetland conservation and increased public awareness. On ground investment is required now despite the relative lack of baseline data. Market based incentive instruments like WetlandsTender will enable investment in priority wetlands whilst accounting for the general lack of knowledge prior to investment.

3.7 Action Plan Development

As aforementioned, wetland action plans will be scoped at the landscape zone scale. This approach is used by the CCMA for analysing and prioritising a range of natural resource management issues and aligns closely with the River Health Strategy and Native Vegetation Plan. Landscape zones are due to become a critical management unit for CCMA programs and wetland action plans will provide ease of information flow into proposed landscape zone plans and priority documents in future.

Landscape scale management has also been recognised for its importance in prioritisation of ecological assets by Heron *et al* (2004). Development of landscape zones within the Corangamite region has been based on a mix of natural and anthropocentric features/activities. However, although actions will be scoped at the landscape zone level, it should be noted that landscape assessment should always include consideration of multiple scales in order to appropriately manage natural systems.

Most of the previous effort in wetland assessment has focused on individual wetlands and has required detailed information on the site specific assessment of physical, chemical and biological attributes. Whilst necessary at listed wetland sites, this approach is unrealistic for all 1500 wetlands of the Corangamite region. A landscape approach is required to narrow the field to a reasonable number of landscape elements in which wetlands lie, that the management agency can deal with.

A useful guide for describing various scales at which wetland prioritisation should be considered is shown in Figure 10.

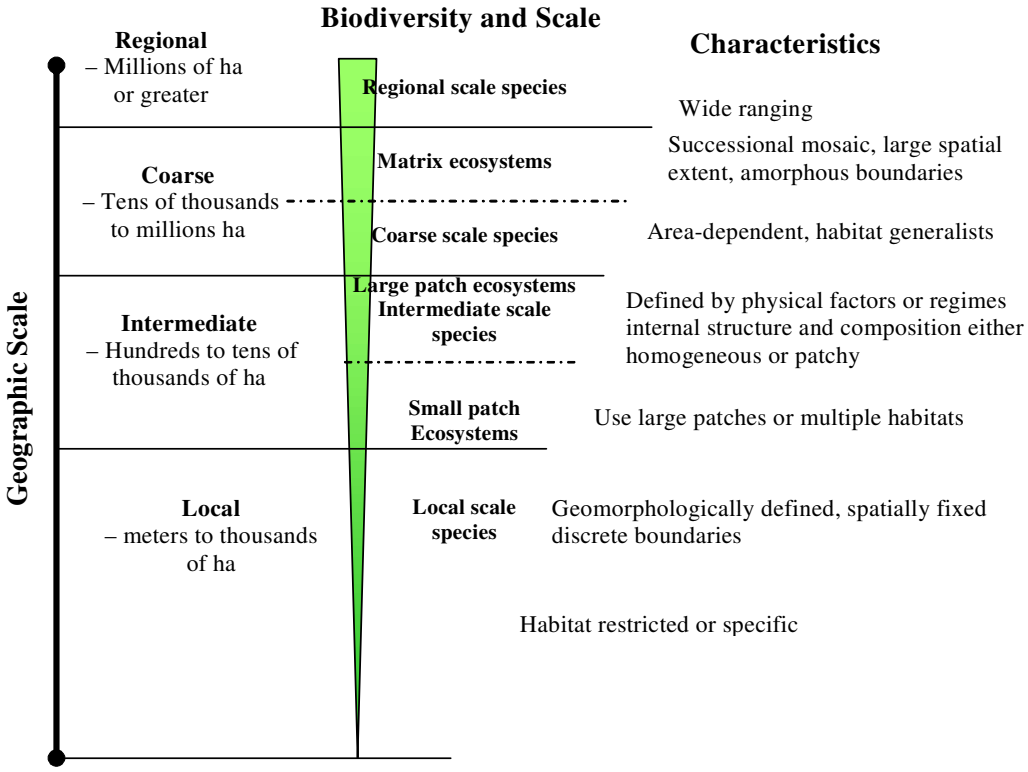


Figure 10 Biodiversity at various spatial scales [Poiani *et al* (2000) in Heron *et al* (2004)]

The majority of the data analysis and database population to support action plan development will occur in the first year of Strategy implementation, however only one finalised wetland action plan is proposed for development in 2005/06 for direct inclusion in a pilot landscape zone plan. Depending on the effectiveness of this process and support for further development of landscape zone plans, remaining wetland action plans will be finalised beyond 2006 in conjunction with future development of landscape zone plans. Failing this a single, comprehensive wetland action plan document will commence development in 2007.

Decision making that can be influenced in the short term until wetland action plans have been developed:

- **Protect representative wetlands –** Wetland types which have declined the most and where these types are most threatened, such as shallow and deep freshwater marshes, especially on private land. Within the Corangamite region, these wetland types have suffered the greatest decline since 1788; therefore remaining examples of these types should be given high priority.

- **Maintain the ecological character of Ramsar sites -** Develop action plans for individual Ramsar and DIWA wetlands in conjunction with the River Health Team. Listed sites are an environmental and social priority and the ecological character and listed values of Ramsar sites are required to be maintained under legislation.

- **Collect information for longer-term decision-making –** A key action of this Strategy is to continue to input regional wetland data into the Corangamite Wetland Information System to assist in future decision-making and wetland prioritisation. An ongoing condition assessment and inventory program is currently being developed.

- **Develop framework for wetland prioritisation -** Develop criteria for prioritising wetlands at the regional scale using triple bottom line asset assessments and the framework outlined in section 3.7.1.

3.7.1 Framework for Asset-based Wetland Prioritisation

Prioritisation of wetlands for protection and enhancement enables CMA's, managing authorities and government to guide investment. The Policy Framework for Wetlands in Victoria (DSE 2003) outlines two prioritisation options for Victoria's wetlands. The first is a simple hierarchy of agreements to protect wetlands which ensures that wetlands considered to have the highest values are protected first, *i.e.*

1. internationally listed wetlands are the highest priority wetlands for protection;
2. nationally significant wetlands; and
3. significant wetlands on a local scale.

The second option, and that adopted for action plan development, involves a more systematic prioritisation process (prioritisation framework and accompanying notes are included in Appendix 12).

This staged approach framework devised by DSE has been somewhat simplified for use by the Mallee CMA (Heron *et al* 2004) (Figure 11). This approach is recommended due to data deficiencies and inconsistencies of data availability between wetlands. The use of existing datasets will enable priority-setting in the short term while improvements in baseline data lead to more complete and comprehensive datasets for longer term prioritisation and management. This approach is also well suited to implementation using a database application.

Wetland prioritisation methods are currently being developed in a consistent and integrated manner by the CMA Wetlands Network with input from DSE, as regional CMA's commence their development of wetlands strategies and action plans.

Lake Victoria, Bellarine Peninsula

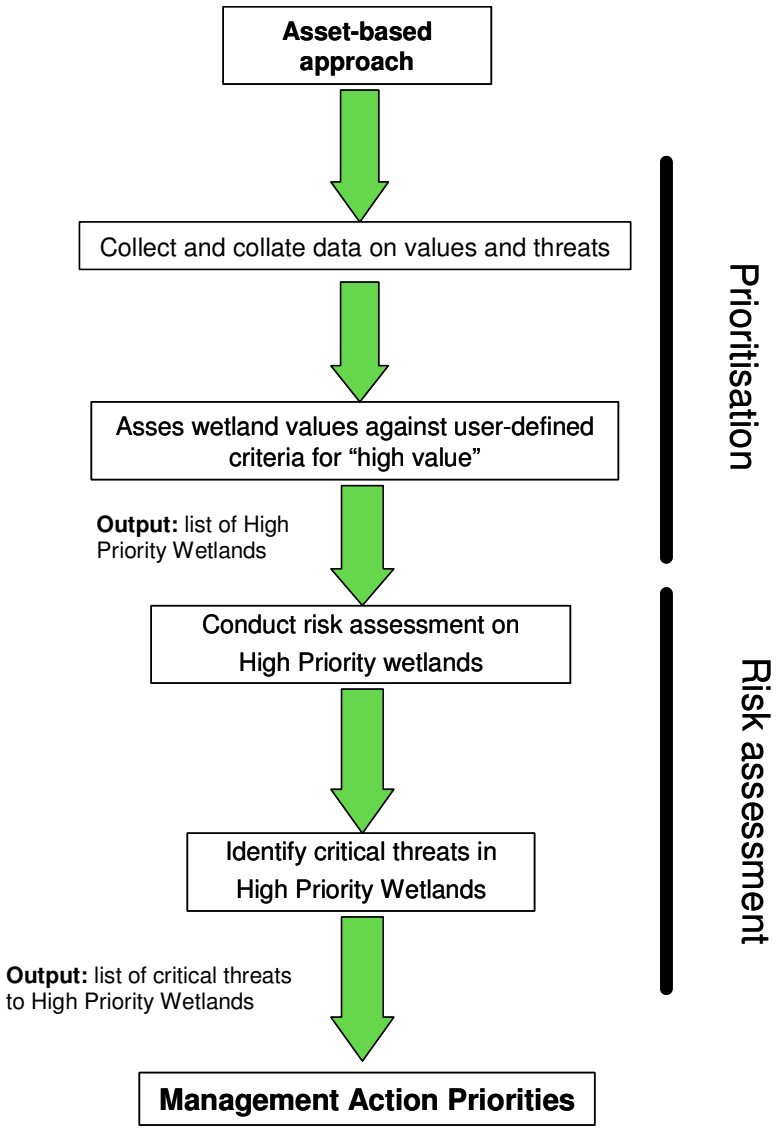


Figure 11 Asset-based prioritisation approach for wetland management (Heron *et al* 2004)

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Paul Whinney		DPI, Geelong
Philip DuGuesclin		DSE, Portland (former DSE, Colac)
Anne Buchan		VVP Ecosystem Stewardship Project – PlainsTender, Corangamite CMA
Kevin Wood		WBM Consulting
Gabrielle Pistone		WBM Consulting
Trevor Pescott		Field Naturalists Club, Geelong

APPENDIX 2 RAMSAR AND DIWA CLASSIFICATION SYSTEMS

Ramsar Wetland Classification System

The Ramsar Classification System for Wetland type has separated wetlands into 3 categories (Marine/Coastal, Inland and Human-made wetlands), and is intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

Marine/Coastal Wetlands

A	Permanent shallow marine waters in most cases less than six metres deep at low tide; includes sea bays and straits.
B	Marine subtidal aquatic beds; includes kelp beds, sea-grass beds, tropical marine meadows.
C	Coral reefs.
D	Rocky marine shores; includes rocky offshore islands, sea cliffs.
E	Sand, shingle or pebble shores; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.
F	Estuarine waters; permanent water of estuaries and estuarine systems of deltas.
G	Intertidal mud, sand or salt flats.
H	Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.
I	Intertidal forested wetlands; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
J	Coastal brackish/saline lagoons; brackish to saline lagoons with at least one relatively narrow connection to the sea.
K	Coastal freshwater lagoons; includes freshwater delta lagoons.
Zk(a)	Karst and other subterranean hydrological systems, marine/coastal

Inland Wetlands

L	Permanent inland deltas.
M	Permanent rivers/streams/creeks; includes waterfalls.
N	Seasonal/intermittent/irregular rivers/streams/creeks.
O	Permanent freshwater lakes (over 8 ha); includes large oxbow lakes.
P	Seasonal/intermittent freshwater lakes (over 8 ha); includes floodplain lakes.
Q	Permanent saline/brackish/alkaline lakes.
R	Seasonal/intermittent saline/brackish/alkaline lakes and flats.
Sp	Permanent saline/brackish/alkaline marshes/pools.
Ss	Seasonal/intermittent saline/brackish/alkaline marshes/pools.
Tp	Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.
Ts	Seasonal/intermittent freshwater marshes/pools on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
U	Non-forested peatlands; includes shrub or open bogs, swamps, fens.
Va	Alpine wetlands; includes alpine meadows, temporary waters from snowmelt.
Vt	Tundra wetlands; includes tundra pools, temporary waters from snowmelt.

W	Shrub-dominated wetlands; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.
Xf	Freshwater, tree-dominated wetlands; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.
Xp	Forested peatlands; peatswamp forests.
Y	Freshwater springs; oases.
Zg	Geothermal wetlands
Zk(b)	Karst and other subterranean hydrological systems, inland

Note : "floodplain" is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland types herein.

Human-made wetlands

1	Aquaculture (e.g., fish/shrimp) ponds
2	Ponds; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
3	Irrigated land; includes irrigation channels and rice fields.
4	Seasonally flooded agricultural land (including intensively managed or grazed wet meadow or pasture).
5	Salt exploitation sites; salt pans, salines, etc.
6	Water storage areas; reservoirs/barrages/dams/impoundments (generally over 8 ha).
7	Excavations; gravel/brick/clay pits; borrow pits, mining pools.
8	Wastewater treatment areas; sewage farms, settling ponds, oxidation basins, etc.
9	Canals and drainage channels, ditches.
Zk(c)	Karst and other subterranean hydrological systems, human-made

Directory of Important Wetlands of Australia Wetland Classification System

This system is based on the Ramsar Classification system, with minor alterations.

A. Marine and Coastal Zone Wetlands

1. Marine waters - permanent shallow waters less than six metres deep at low tide; includes sea bays and straits.
2. Subtidal aquatic beds; includes kelp beds, sea-grass beds, tropical marine meadows
3. Coral reefs.
4. Rocky marine shores; includes rocky offshore islands, sea cliffs
5. Sand, shingle or pebble beaches; includes sand bars, spits and sandy islets
6. Estuarine waters; permanent water of estuaries and estuarine systems of deltas
7. Intertidal mud, sand or salt flats
8. Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes
9. Intertidal forested wetlands; includes mangrove swamps, nipa swamps and tidal freshwater swamp forests
10. Brackish to saline lagoons and marshes with one or more relatively narrow connection with the sea.
11. Freshwater lagoons and marshes in the coastal zone
12. Non tidal freshwater forested wetlands

B. Inland Wetlands

1. Permanent rivers and streams; includes waterfalls
2. Seasonal and irregular rivers and streams
3. Inland deltas (Permanent)
4. Riverine floodplains; includes fiver flats, flooded river basins, seasonally flooded grassland, savanna and palm savanna.
5. Permanent freshwater lakes (over 8 ha); includes large oxbow lakes
6. Seasonal/intermittent freshwater lakes (over 8 ha); includes floodplain lakes
7. Permanent saline/brackish lakes
8. Seasonal/intermittent saline lakes
9. Permanent freshwater ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.
10. Seasonal/intermittent freshwater ponds and marshes on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
11. Permanent saline/brackish marshes
12. Seasonal saline marshes
13. Shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils
14. Freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.
15. Peatlands; forest, shrub or open bog
16. Alpine and tundra wetlands; includes alpine meadows, tundra pools, temporary waters from snowmelt
17. Freshwater springs, oases and rock pools
18. Geothermal wetlands
19. Inlands, subterranean karst wetlands

C. Human-made Wetlands

1. Water storage areas; reservoirs, barrages, hydro electric dams, impoundments (generally over 8 ha)
2. Ponds; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
3. Aquaculture ponds; fish ponds, shrimp ponds
4. Salt exploitation; salt pans, salines
5. Excavations; gravel pits, borrow pits, mining pools
6. Wastewater treatment; sewage farms, settling ponds, oxidation basins
7. Irrigated land and irrigation channels; rice fields, canals, ditches
8. Seasonally flooded arable land, farm land
9. Canals

APPENDIX 3 THREATENED FAUNA

Scientific name	Common name	FFG listed	Threatened in Victoria	EPBC	JAMBA/ CAMBA	Bonn
Birds						
Actitis hypoleucos	Common Sandpiper				C	
Anas rhynchotis	Australasian Shoveler		v			
Anseranas semipalmata	Magpie Goose		e			
Ardea alba	Great Egret	L	e		C	
Ardea ibis	Cattle Egret				C	
Ardea intermedia	Intermediate Egret	L	c		C	
Arenaria interpres	Ruddy Turnstone				C	
Aythya australis	Hardhead		v			
Biziura lobata	Musk Duck		v			
Botaurus poiciloptilus	Australasian Bittern		e			
Calidris acuminata	Sharp-tailed Sandpiper				C	
Calidris alba	Sanderling				C	
Calidris canutus	Red Knot				C	X
Calidris ferruginea	Curlew Sandpiper				C	X
Calidris melanotos	Pectoral Sandpiper		i		J	
Calidris ruficollis	Red-necked Stint				C	
Calidris subminuta	Long-toed Stint		i		C	
Calidris tenuirostris	Great Knot				C	X
Cereopsis novaehollandiae	Cape Barren Goose		v			
Charadrius mongolus	Lesser Sand Plover				C	X
Chlidonias hybridus	Whiskered Tern		I			
Chlidonias leucopterus	White-winged Black Tern				C	X
Coturnix ypsilophora	Brown Quail		i			
Egretta garzetta	Little Egret		c			
Gallinago hardwickii	Latham's Snipe				C	
Grus rubicunda	Brolga	L	v			

Scientific name	Common name	FFG listed	Threatened in Victoria	EPBC	JAMBA/ CAMBA	Bonn
Heteroscelus brevipes	Grey-tailed Tattler				C	
Ixobrychus minutus	Little Bittern		e			X
Laurus dominicanus	Kelp Gull		I			
Larus pacificus	Pacific Gull		I			
Limicola falcinellus	Broad-billed Sandpiper				C	X
Limosa lapponica	Bar-tailed Godwit				C	X
Limosa limosa	Black-tailed Godwit				C	X
Morus serrator	Australasian Gannet		v			
Neophema chrysogaster	Orange-bellied Parrot		c	E		
Ninox connivens	Barking Owl		e			
Numenius madagascariensis	Eastern Curlew		I		C	
Numenius minutus	Little Curlew				C	
Numenius phaeopus	Whimbrel				C	X
Nycticorax caledonicus	Nankeen Night Heron		v			
Oxyura australis	Blue-billed Duck	L	v			
Pachyptila turtur	Fairy Prion		I	V		
Pelecanus conspicillatus	Australian Pelican		s			
Phalacrocorax fuscescens	Black-faced Cormorant		v			
Phalacrocorax varius	Pied Cormorant		I			
Phalaropus lobatus	Red-necked Phalarope				C	X
Philomachus pugnax	Ruff				C	X
Platalea regia	Royal Spoonbill		v			
Plegadis falcinellus	Glossy Ibis		v		C	X
Pluvialis fulva	Pacific Golden Plover				C	
Pluvialis squatarola	Grey Plover				C	X
Porzana pusilla	Baillon's Crake		v			X
Puffinus tenuirostris	Short-tailed Shearwater				J	
Rallus pectoralis	Lewin's Rail		e			
Rostratula benghalensis	Painted Snipe		e		C	

Scientific name	Common name	FFG listed	Threatened in Victoria	EPBC	JAMBA/ CAMBA	Bonn
Stercorarius parasiticus	Arctic Jaeger				J	
Sterna albifrons	Little Tern	L	v		C	X
Sterna bergii	Crested Tern		I			X
Sterna caspia	Caspian Tern		v		C	X
Sterna hirundo	Common Tern				C	X
Sterna nereis	Fairy Tern	L	v			
Sterna nilotica	Gull-billed Tern		e			X
Stictonetta naevosa	Freckled Duck	L	e			
Thinornis rubricollis	Hooded Plover	L	e			
Tringa glareola	Wood Sandpiper				C	X
Tringa nebularia	Common Greenshank				C	X
Tringa stagnatilis	Marsh Sandpiper				C	X
Xenus cinereus	Terek Sandpiper				C	
Mammals						
Antechinus minimus	Swamp Antechinus		I			
Mastacomys fuscus	Broad-toothed Rat		I			
Sminthopsis crassicaudata	Fat-tailed Dunnart		I			
Reptiles & Amphibians						
Delma impar	Striped Legless Lizard	L	e	V		
Egernia coventryi	Swamp Skink	L	v			
Eulamprus tympanum marnieae	Corangamite Water Skink	L	c	E		
Litoria raniformis	Warty Bell Frog	L	e	V		
Pseudophryne semimarmorata	Southern Toadlet		v			
Pseudophryne bibronii	Brown Toadlet		e			
Pseudemoia rawlinsoni	Glossy Grass Skink		I			
Fish						
Edelia obscura	Yarra Pygmy Perch	L	I	V		
Galaxias cleaveri	Australian Mudfish	L	c			
Galaxiella pusilla	Dwarf Galaxias	L	v	V		

Scientific name	Common name	FFG listed	Threatened in Victoria	EPBC	JAMBA/ CAMBA	Bonn
Prototroctes maraena	Australian Grayling	L	v	V		
Invertebrates						
Archaeophylax canarus	Caddis fly		r			
Orphinotrichia justini	Caddis fly		i			
Taskiria otwayensis	Caddis fly (5024)		e			

Flora and Fauna Guarantee Act (FFG)
L = Listed

Species Threatened in Victoria
c = critically endangered
e = endangered
v = vulnerable
i = insufficient data
l = lower risk
r = rare
s = significant species in Corangamite Region

Species Threatened in Australia (EPBC listed)
E = Endangered
V = Vulnerable

JAMBA
J

CAMBA
C

Bonn Convention
X

APPENDIX 4 THREATENED FLORA

Scientific name	Common name	FFG listed	Threatened in Victoria	EPBC
Acacia retinodes var. *uncifolia*	Coast Wirilda		r	
Agrostis adamsonii	Adamson's Blown-grass	L	v	E
Agrostis aemula var. *setifolia*	Gilgai Blown-grass		v	
Alternanthera sp. 1 (Plains)	Plains Joyweed		k	
Amphibromus fluitans	River Swamp Wallaby-grass		k	V
Amphibromus sinuatus	Wavy Swamp Wallaby-grass		v	
Anzybas fordhamii	Swamp Pelican-orchid		r	
Atriplex australasica	Native Orache		k	
Atriplex paludosa ssp. *paludosa*	Marsh Saltbush		r	
Austrostipa gibbosa	Spurred Spear-grass		r	
Austrostipa setacea	Corkscrew Spear-grass		r	
Avicennia marina ssp. *australasica*	White Mangrove		r	
Baumea laxa	Lax Twig-sedge		r	
Berula erecta	Water Parsnip		k	
Callitriche palustris	Swamp Water-starwort		k	
Calorophus elongatus	Long Rope-rush		v	
Cardamine tenuifolia	Slender Bitter-cress		k	
Carex tasmanica	Curley Sedge	L	v	V
Chorizandra australis	Southern Bristle-sedge		k	
Craspedia paludicola	Swamp Billy-buttons		v	
Cullen parvum	Small Scurf-pea	L	e	E
Cullen tenax	Tough Scurf-pea	L	e	
Cuscuta tasmanica	Golden Dodder		k	
Elymus multiflorus	Short-awned Wheat-grass		k	
Eucalyptus leucoxylon ssp. *bellarinensis*	Yellow Gum	L	e	
Glycine latrobeana	Clover Glycine	L	v	V
Helichrysum aff. *rutidolepis* (Lowland Swamps)	Pale Swamp Everlasting		v	
Isolepis victoriensis	Victorian Club-sedge		k	
Isolepis wakefieldiana	Trufted Club-sedge`		r	
Juncus bassianus	Bass Rush		k	
Juncus revolutus	Creeping Rush		r	
Lachnagrostis filiformis (perennial variety)	Wetland Blown-grass		k	
Lawrencia spicata	Salt Lawrencia		r	

Scientific name	Common name	FFG listed	Threatened in Victoria	EPBC
Lemna trisulca	Ivy-leaf Duckweed		k	
Lepidium aschersonii	Spiny Peppercress	L	e	V
Lepidium hyssopifolium	Basalt Peppercress	L	e	E
Lepilaena marina	Sea Water-mat		v	
Limonium australe	Yellow Sea-lavender		r	
Lotus australis	Austral Trefoil		k	
Lycopodiella serpentine	Bog Clubmoss		r	
Microseris sp. 1	Plains Yam-daisy		v	
Olearia speciosa	Netted Daisy-bush		k	
Persicaria attenuata	Velvet Knotweed		k	
Pimelea spinescens ssp. *spinescens*	Spiny Rice-flower		e	V
Poa sallacustris	Salt-lake Tussock-grass		v	V
Ranunculus aff. *inundatus* (South-west)	South-west River Buttercup		k	
Ranunculus diminutus	Lesser River Buttercup		k	
Ranunculus sessiliflorus var. *pilulifer*	Annual Buttercup		k	
Rutidosis leptorrhynchoides	Button Wrinklewort		e	E
Salsola kali aff. ssp. *tragus*	Coast Saltwort		r	
Schoenus carsei	Wiry Bog-sedge		r	
Schoenus nanus	Tiny Bog-sedge		k	
Schoenus sculptus	Gimlet Bog-sedge		r	
Schoenus turbinatus	Top Bog-sedge		r	
Senecio psilocarpus	Swamp Fireweed		v	V
Thelymitra circumsepta	Naked Sun-orchid		v	
Triglochin minutissimum	Tiny Arrowgrass		r	
Triglochin mucronatum	Prickly Arrowgrass		r	
Xerochrysum palustre	Swamp Everlasting	L	v	V

Flora and Fauna Guarantee Act (FFG)
L = Listed

Species Threatened in Victoria
e = endangered
v = vulnerable
r = rare
k = poorly known

Species Threatened in Australia (EPBC listed)
E = Endangered
V = Vulnerable

APPENDIX 5 WETLAND ECOLOGICAL VEGETATION CLASSES

Wetland EVC's have recently been revised for inclusion in the Index of Wetland Condition project. However, due to limitations of state mapping, original EVC's and associated data are presented in the table below. **Note:** EVC mapping for regional wetlands is extremely poor and area figures provided are indicative only. Information extracted from Appendix 6 of the Corangamite Native Vegetation Plan 2003-2008 (CCMA 2005a).

EVC no.	EVC Name	EVC Bioregional Conservation Status	1788 Extent (ha)	Current Extant (ha)	Current Reserve Extant (%)
Central Victorian Uplands Bioregion					
74	Wetland Formation	E	163	0	NA
125	Plains Grassy Wetland	E	89	5	0%
647	Plains Sedgy Wetland	E	176	16	52%
691	Aquatic Herbland / Plains Sedgy Wetland Mosaic	E	61	51	87%
746	Damp Heathland / Damp Heathy Woodland Mosaic	V	142	8	0%
998	Water Body – Natural or man made	NA	0	648	2%
Otway Plain Bioregion					
8	Wet Heathland	LC	1,781	1,393	89%
9	Coastal Saltmarsh	V	3,827	1,894	93%
10	Estuarine Wetland	E	81	57	46%
53	Swamp Scrub	E	1,888	215	25%
56	Floodplain Riparian Woodland	E	6,069	302	0%
74	Wetland Formation	E	233	54	75%
83	Swampy Riparian Woodland	E	2,799	339	0%
104	Lignum Wetland	E	80	3	0%
125	Plains Grassy Wetland	X	23	0	NA
140	Mangrove Shrubland	V	93	58	86%
196	Seasonally-inundated Sub-saline Herbland	R	58	58	100%
198	Sedgy Riparian Woodland	D	2,382	1,497	41%
200	Shallow Freshwater Marsh	E	4	4	0%
300	Reed Swamp	V	565	517	100%

EVC no.	EVC Name	EVC Bioregional Conservation Status	1788 Extent (ha)	Current Extant (ha)	Current Reserve Extant (%)
647	Plains Sedgy Wetland	X	373	1	0%
691	Aquatic Herbland/Plains Sedgy Wetland Mosaic	E	115	1	0%
863	Floodplain Reedbed	X	107	0	NA
891	Plains Brackish Sedge Wetland	V	29	16	100%
898	Cane Grass-Lignum Halophyllic Herbland	V	137	89	87%
899	Plains Freshwater Sedge Wetland	V	91	82	100%
998	Water Body – Natural or man made	NA	1,316	1,887	78%
Otway Ranges Bioregion					
8	Wet Heathland	D	198	115	91%
10	Estuarine Wetland	E	3	2	18%
53	Swamp Scrub	E	217	50	5%
83	Swampy Riparian Woodland	E	8	1	0%
198	Sedgy Riparian Woodland	V	93	71	63%
998	Water Body – Natural or man made	NA	0	9	76%
Victorian Volcanic Plain Bioregion					
53	Swamp Scrub	E	14,963	328	2%
56	Floodplain Riparian Woodland	E	9,264	670	0%
83	Swampy Riparian Woodland	E	1,953	142	0%
104	Lignum Wetland	E	6	0	NA
125	Plains Grassy Wetland	X	3,948	63	0%
200	Shallow Freshwater Marsh	E	6	0	NA
292	Red Gum Wetland	E	9	0	NA
647	Plains Sedgy Wetland	E	10,697	326	3%
691	Aquatic Herbland / Plains Sedgy Wetland Mosaic	E	5,264	295	3%
998	Water Body – Natural or man made	NA	49,346	43,943	10%

Warrnambool Plain Bioregion					
8	Wet Heathland	E	3,120	571	64%
10	Estuarine Wetland	E	809	251	25%
53	Swamp Scrub	E	10,545	344	2%
125	Plains Grassy Wetland	X	8	0	NA
198	Sedgy Riparian Woodland	E	2,890	415	48%
300	Reed Swamp	E	39	12	0%
647	Plains Sedgy Wetland	X	609	2	0%
681	Deep Freshwater Marsh	E	6	0	0%
684	Permanent Saline	NA	286	8	0%
691	Aquatic Herbland / Plains Sedgy Wetland Mosaic	E	618	4	0%
998	Water Body – Natural or man made	NA	30	33	40%

EVC Bioregional Conservation Status

D = Depleted

Greater than 30% and up to 50% pre-European extent remains; OR combination of depletion, degradation and current threats is comparable overall to the above and:

- greater than 50% pre-European extent remains and moderately degraded over a majority of this area.

E = Endangered

Contracted to less than 10% of former range; OR less than 10% pre-European extent remains; OR combination of depletion, degradation, current threats and rarity is comparable overall to the above:

- 10 to 30% pre-European extent remains and severely degraded over a majority of this area;
- naturally restricted EVC reduced to 30% or less of former range and moderately degraded over a majority of this area; or
- rare EVC cleared and/or moderately degraded over a majority of former area.

LC = Least Concern

Greater than 50% pre-European extent remains and subject to little to no degradation over a majority of this area.

R = Rare

Rare EVC (as defined by geographic occurrence) but neither depleted, degraded nor currently threatened to an extent that would qualify as Endangered, Vulnerable or Depleted.

V = Vulnerable

10 to 30% pre-European extent remains; OR combination of depletion, degradation, current threats and rarity is comparable overall to the above:

- greater than 30% and up to 50% pre-European extent remains and moderately degraded over a majority of this area; or
- greater than 50% pre-European extent remains and severely degraded over a majority of this area; or
- naturally restricted EVC where greater than 30% pre-European extent remains and moderately degraded over a majority of this area; or
- rare EVC cleared and/or moderately degraded over a minority of former area.

X = Presumed Extinct

Probably no longer present in the bioregion (the accuracy of this resumption is limited by the use of remotely - sensed 1:100 000 scale woody vegetation cover mapping to determine depletion - grassland, open woodland and wetland types are particularly affected.

NA = Not Applicable

APPENDIX 6 CRITERIA FOR LISTING SIGNIFICANT WETLANDS

RAMSAR

Group A of the Criteria. Sites containing representative, rare or unique wetland types

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B of the Criteria. Sites of international importance for conserving biological diversity

Criteria based on species and ecological communities

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports one percent of the individuals in a population of one species or subspecies of water bird.

Specific criteria based on fish

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

DIRECTORY OF IMPORTANT WETLANDS IN AUSTRALIA (DIWA)

The criteria for determining nationally important wetlands in Australia, and hence inclusion in the Directory, are those agreed to by the ANZECC Wetlands Network in 1994 and used in the second edition.

A wetland may be considered nationally important if it meets at least one of the following criteria:

1. *It is a good example of a wetland type occurring within a biogeographic region in Australia.*
2. *It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex.*
3. *It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.*
4. *The wetland supports one percent or more of the national populations of any native plant or animal taxa.*
5. *The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.*
6. *The wetland is of outstanding historical or cultural significance.*

Many of the sites in the Directory meet more than one of the criteria. Application of the criteria to individual wetland sites involves a degree of subjectivity. Not only may certain aspects of a site's significance be interpreted differently by different investigators, but information gaps often exist which make it difficult to judge whether or not a site meets a particular criterion.

The Interim Biogeographic Regionalisation for Australia (IBRA) is used as the framework for applying Criterion 1, which identifies wetlands that are unique or representative within a biogeographic region in Australia.

EAST ASIAN-AUSTRALIASIAN SHOREBIRD NETWORK SITES

Criteria for sites to qualify for inclusion in the Network are modelled on the Ramsar Convention's "Special Criteria Based on Waterfowl for Identifying Wetlands of International Importance".

As such the criteria for a site are:

- it regularly supports > 20,000 migratory shorebirds; or,
- it regularly supports > one percent of the individuals in a population of one species or subspecies of migratory shorebird; or,
- it supports appreciable numbers of an endangered or vulnerable population of migratory shorebird.

During migration shorebirds stop at sites for brief periods to replenish their energy reserves and these sites are called "staging sites". A feature of staging sites is that the number of shorebirds supported is much greater than at any one count, because of movement of birds through the site. The guideline for applying the criteria to staging sites will be to use a multiplication factor of 4 for species that stage at these sites. That is the site would need to support a total of 5,000 staging shorebirds or 0.25% of a staging shorebird species.

NATIONAL ESTATE

Criterion A: its importance in the course, or pattern, of Australia's natural or cultural history

A.1 Importance in the evolution of Australian flora, fauna, landscapes or climate.

A.2 Importance in maintaining existing processes or natural systems at the regional or national scale.

A.3 Importance in exhibiting unusual richness or diversity of flora, fauna, landscapes or cultural features.

A.4 Importance for association with events, developments or cultural phases which have had a significant role in the human occupation and evolution of the nation, State, region or community.

Criterion B: its possession of uncommon, rare or endangered aspects of Australia's natural or cultural history

B.1 Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness.

B.2 Importance in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised, in danger of being lost, or of exceptional interest

Criterion C: its potential to yield information that will contribute to an understanding of Australia's natural or cultural history

C.1 Importance for information contributing to a wider understanding of Australian natural history, by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.

C.2 Importance for information contributing to a wider understanding of the history of human occupation of Australia.

Criterion D: its importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments

D.1 Importance in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class.

D.2 Importance in demonstrating the principal characteristics of the range of human activities in the Australian environment (including way of life, philosophy, custom, process, land use, function, design or technique).

Criterion E: its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group

E.1 Importance for a community for aesthetic characteristics held in high esteem or otherwise valued by the community.

Criterion F: its importance in demonstrating a high degree of creative or technical achievement at a particular period

F.1 Importance for its technical, creative, design or artistic excellence, innovation or achievement.

Criterion G: its strong or special associations with a particular community or cultural group for social, cultural or spiritual reasons

G.1 Importance as a place highly valued by a community for reasons of religious, spiritual, symbolic, cultural, educational, or social associations.

Criterion H: its special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history

H.1 Importance for close associations with individuals whose activities have been significant within the history of the nation, State or region.

WETLANDS OF BIOREGIONAL SIGNIFICANCE (NLWRA)

Criteria used to identify bioregionally significant wetlands:

1. wetlands are identified in State/Territory lists of important wetlands
2. significant for the maintenance of ecological processes at a subregional scale
3. important for breeding, feeding, roosting, moulting or nursery areas, or refugia for animal taxa
4. supports significant number of plant and animal taxa including migratory species and/or supports a significant abundance of some taxa
5. contains rare or threatened species/ecosystems.

It should be noted that the bioregionally significant wetland layer/dataset developed for the NLWRA was created from a desktop study only. Existing data gaps made it difficult to populate fields for all criteria, leaving many fields blank within the database. Data reliability cannot be determined without field checking. The desktop study addressed the criteria as follows:

- Criterion 2 was not addressed, as no data were available;
- Criterion 3, only the aspect of importance for breeding of colonially nesting waterbirds was addressed; and
- Criterion 4, only the importance for migratory shorebirds was addressed.

APPENDIX 7 LEGISLATIVE AND POLICY FRAMEWORK

A brief overview of the key wetland related legislation, agreements and policy that relate to wetland management and use within the Corangamite region.

Policy instrument	Objective
International	
Asia-Pacific Migratory Waterbird Conservation Strategy (2001-2005)	Provides the international framework for the conservation of migratory waterbirds and their habitats in the Asia-Pacific region.
China – Australia Migratory Bird Agreements (CAMBA 1986)	A bilateral agreement that provides for cooperation to protect migratory species that move between the two countries and which are listed in the Agreement. Agreements also provide for protecting habitat and for information sharing and conduction of joint research.
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1991)	Aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty concerned with the conservation of wildlife and wildlife habitats on a global scale.
East Asian – Australasian Shorebird Site Network	Aims to ensure the long-term conservation of migratory shorebirds in the East Asian - Australasian Flyway.
Japan – Australia Migratory Bird Agreements (JAMBA 1974)	A bilateral agreement that provides for cooperation to protect migratory species that move between the two countries and which are listed in the Agreement. Agreements also provide for protecting habitat and for information sharing and conduction of joint research.
Ramsar Convention on Wetlands (1971)	Provides framework for national action and international cooperation for the conservation and wise use of wetlands (see Appendix 6 for Ramsar site listing criteria).
Australia	
Commonwealth Wetlands Policy (1997)	Aims to build wetland conservation into the daily business of the Commonwealth government. It aims to ensure wetlands are managed in accordance within the principles of Ecologically Sustainable Development (ESD).
Directory of Important Wetlands in Australia (DIWA)	Identifies wetland sites of national significance based on a range of ecological criteria (See Appendix 6). There are 159 Victorian wetlands listed n the DIWA and 24 in the Corangamite region.
Environment Protection and Biodiversity Conservation Act 1999	Identifies areas or values of national environmental significance including Ramsar sites, listed migratory species and nationally threatened species. It also ensures that rigorous environmental assessment processes are undertaken to protect these values.
National Action Plan for Communication, Education and Public Awareness to Promote Wise Use of Australia's Wetlands (2002-2005)	The role of this Plan is to provide a framework for the effective and collaborative delivery of wetland CEPA activities across Australia. The Plan outlines actions to promote coordinated communication and education between all levels of government, statutory authorities, community groups, non-government and business organisations involved in wetland and wetland-related management throughout Australia.
National Wetlands Program (1989)	Provides a means for the Commonwealth Government to work with state and Territory Governments to implement Australia's obligations under Ramsar and also supports international treaties (JAMBA/CAMBA). The program supports the conservation, repair and wise use of wetlands in Australia.

Victoria	
Catchment and Land Protection Act (1994)	Provides an integrated catchment management framework and facilitates the wise management of land and water resources in a whole of catchment framework.
Coastal Act 1995	Development of the Victoria Coastal Strategy which implements key provisions of the Act relating to the protection of Victoria's coastline.
DSE Wetland Database	Aims to provide a wetland database of wetlands greater than one hectare in area that have been comprehensively categorized and mapped for the State according to water depth, duration of inundation, salinity and dominant vegetation as a tool to aid in wetland management.
Environment Protection Act 1970	Provides the regulatory framework for protection of environmental assets particularly water quality.
Environmental Effects Act 1978	Allows for the development of Environmental Effects Statements on high environmental impact proposals.
Fisheries Act (1995)	Provides for the regulation, management and conservation of fisheries and aquatic habitats, together with the reform of the law relating to fisheries.
Flora and Fauna Guarantee Act (1988) and Action Statements	Provide a legislative framework for the conservation of biodiversity in Victoria. Provides for the listing of threatened species and communities and the preparation of Action Statements for these assets. It also allows for the listing of potentially threatening processes.
Indigenous Partnership Strategy (2001)	Provides the framework for building effective relationships with indigenous communities, who have a fundamental role in the management of Victoria's natural resources, as traditional custodians of land and waters.
Planning and Environment Act (1987)	Sets out objectives for planning in Victoria and outlines the planning process and requirements for planning schemes. Includes the development of planning permit applications for which DSE may be a referral authority.
Policy Framework for Wetlands in Victoria (Draft 2003)	Provides a policy framework for the management of wetlands in Victoria and identifies the key principles and implementation tools for wetland protection. Includes an overview of wetland classification, values and threats, as well as a framework for wetland prioritisation.
State Environment Protection Policy: Waters of Victoria (2001)	Provides the basis for protecting water quality in all surface waters in Victoria. It also provides a legal framework for government agencies, businesses and communities to protect and rehabilitate Victorian rivers, lakes, wetlands, estuaries, bays and oceans, so that current and future generations can safely use and enjoy them.
Victoria Coastal Strategy (2002)	Establishes a framework for the integrated planning of coastal and marine environments (including inertial wetlands). It ensures sustainable use of natural resources and the protection of significant environmental features.
Victoria's Biodiversity Strategy (1997)	States Victoria's wetlands policy and goals for biodiversity management in Victoria. The vision for wetlands is to protect Victoria's wetland biodiversity by promoting the conservation and wise use of all wetlands.
Victoria's Planning Provisions	Provides councils with the means of controlling land use and development to protect wetlands and waterways. VPP's also create the opportunity to use planning measures to protect wetlands generally through Municipal Strategic Statements, local planning policies and the use of a range of zones and overlays.

Victoria Cont'd	
Victoria's Ramsar sites - Strategic Directions Statement and Strategic Management Plans (Western District Lakes and Port Phillip Bay (Western Shoreline) & Bellaraine Peninsula sites)	Australia and therefore Victoria has an obligation to maintain the ecological character of Ramsar sites. These documents guide the management of Ramsar sites at a State and Site level through the development of objectives and strategies to ameliorate key threats and risks affecting environmental values of Ramsar sites.
Victorian Environmental Assessment Council Act (2001)	Allows for the classification of public land based on its environmental values and key uses. It also allows for the implementation of management recommendations based on the land classification.
Victorian River Health Strategy (2002)	Provides a framework that enables government and community to manage and restore State rivers. It aims to achieve healthy rivers, streams and floodplains which meet the environmental, economic, recreational and cultural needs of current and future generations. This Strategy does not apply to non-floodplain wetlands.
Water Act (1989) including Water (Irrigation Farm Dams) Act 2002	Sets out a legislative framework for the allocation of environmental flows in rivers and wetlands in Victoria.
Wetlands of bioregional significance	Criteria were developed for the National Land and Water Resources Audit to provide a national framework for assessing wetland significance at the bioregional level (See Appendix 6 for criteria). A preliminary desktop assessment using these criteria was undertaken by NRE in 2002 to identify over 2000 bioregionally significant wetlands. This assessment provides a first step in identifying wetlands of significance at the bioregional level.
Wildlife Act 1975	Provides for the protection of wildlife and game hunting.
Regional	
Regional Catchment Strategy	Provides regional priorities relating to wetland assessment, prioritisation and investment at the catchment level. Provides the framework for the development of wetland management actions for high priority wetlands.
Draft Corangamite Native Vegetation Plan 2003-2008	Strategically directs future programs and actions for achieving a net gain in native vegetation and related biodiversity across the Region, and prioritises management options on a regional basis.
Draft Corangamite River Health Strategy	Identifies and ranks stream reaches requiring management and/or rehabilitation using the Victorian Index of Stream Condition parameters, and itemizes management actions required for each stream reach.
Draft Corangamite Salinity Action Plan (2003-2008)	Uses results of a formal Geospatial SHARP Model (2003) to identify 12 key areas for salinity management, covering social, environmental and economic assets threatened by secondary salinity and describes areas of primary salinity assets.
Corangamite Floodplain Management Strategy	Identifies strategic management requirements for floodplains, presents flood management and emergency response plans, guides development and land use practices, and provides an integrated floodplain management information system.
Corangamite Weed Action Plan (2001-2004)	Sets out a range of actions for the management of priority pest plants, amongst the 58 declared noxious weed species in the Region using a risk management approach.
Corangamite Rabbit Action Plan (2001-2006)	Sets out strategic priorities for rabbit management in the Region, to abate the detrimental impacts of rabbits on agricultural productivity, soil stability, native vegetation, biodiversity and water quality.

APPENDIX 8 KEY REGIONAL AGENCIES AND RESPONSIBILITIES

Agency/stakeholder	Key Responsibilities/role in wetland management	Local agency
Committees of Management	Manage reserved Crown Land on behalf of the Minister. Committees are usually the local Shire or publicly elected.	Parks Victoria, Municipalities, elected committees (*i.e.* Lake Corangamite and Lake Gnarpurt)
Department of Primary Industries (DPI)	Provide wetland advice and expertise and manage flora and fauna bulk water entitlements. Coordination of water quality and salinity programs as well as catchment management, fisheries management and agricultural services.	DPI: Geelong, Colac, Ballarat
Department of Sustainability and Environment (DSE)	Provide strategic direction for park and reserve management, flora and fauna management and research, licence management and implementation of the Ramsar Convention in Victoria. Provide strategic coordination of wetland policy for Victoria, River Health Strategy for Victoria and significant statewide projects.	DSE: Geelong, Colac, Ballarat, Warrnambool
Environment Protection Authority (EPA)	Coordinate all activities relating to the discharge of waste into the environment and the generation of storage, treatment, transport and disposal of industrial waste and the emission of noise and for preventing or controlling pollution and noise and protecting and improving the quality of the environment.	EPA: Geelong
Indigenous Communities	Land management and cultural interests.	Ballarat Aboriginal Cooperative Wathaurong Aboriginal Cooperative Framlingham Aboriginal Trust
Local Government/Shires	Regulate local development through planning schemes, on ground works and management of local roads and urban and some rural drainage. Strategic implementation of Municipal Strategic Statements and planning schemes to enhance and protect wetland assets.	Colac-Otway Shire Corangamite Shire Surf Coast Shire City of Greater Geelong Borough of Queenscliff Moorabool Shire City of Ballarat Moyne Shire Golden Plains Shire
Non-metropolitan Urban Water Authorities	Provide urban water supplies and waste water disposal services.	Central Highlands Water Barwon Water

Agency/stakeholder	Key Responsibilities/role in wetland management	Local agency
Parks Victoria	Manage parks and reserves.	Parks Victoria: Colac, Warrnambool, Queenscliff
Rural Water Authorities	Provide irrigation, drainage, water supply, and management of specific water supply catchments	Southern Rural Water
Victorian Catchment Management Council	Advise state government on catchment management and land and water resource issues and priorities. Encourage cooperation between land and water managers. Promote community awareness on catchment management issues.	Corangamite CMA
Victorian Coastal Council and Coastal Boards	Prepare Victorian Coastal Strategy and Coastal Action Plans and advise on coastal development and management.	Western Coastal Board

Table adapted from DNRE (2002c and e) and DNRE (2003

APPENDIX 9 OBJECTIVE HIERARCHY FOR STRATEGIC INVESTMENT PLAN

Maintain the extent and enhance the quality of wetlands in the Corangamite region through a community inspired to conserve and wisely use these assets

Improve wetland management

Appropriate management determined and undertaken

- Establish and address R&D priorities. Incorporate in R&D strategy and annual plans
- Implement existing wetland management plans, i.e. Ramsar site plans, relevant Threatened Species Recovery Plans
- Develop and/or update plans for Ramsar and DIWA sites
- Initiate wetland buyback schemes for reserve system
- Nominate sites for significance listing
- Increase conservation security, i.e. covenants and conservation agreements

Land managers enabled to manage for conservation

- **Design and implement a range of incentive schemes (i.e. MBI's, tax breaks, rate rebates, grants)**
- Provide assistance and support to land managers
- Support EBMP and whole-farm planning
- Create opportunities to learn
- Prepare BMP guidelines and tools to facilitate wetland management & facilitate dissemination of information to landholders
- Develop and market decision making frameworks for new projects

Capacity of CMA, Department and industry staff to support landholders strengthened

- Train field officers in the assessment of wetland systems and negotiation of conservation services with landholders
- Integrate with key projects in the region
- Identify and communicate enforcement capacity and roles and responsibilities of relevant authorities
- Coordinate to bring stakeholders together and strengthen partnerships (cultural heritage)
- Lessons learned/case studies developed
- Re-establish environmental flows/natural water regimes for wetland assets as part of the broader CCMA responsibility

Increase public awareness of wetland

Awareness of wetlands increased

- Community education plan
- School education packages (primary and secondary)
- Two annual wetland awareness raising events
- Develop extension materials on wetlands
- Displays/presentations at field days
- Promote wetlands through tourism
- Regular media representation of wetland projects

Prioritisation of regional wetlands

Increased wetland information

- Revision of wetland information system to enable prioritisation and risk assessment capabilities
- Review existing data and identify gaps
- Tools developed for assessment procedures
- Inventory of sub-regional wetlands (rolling)
- Condition assessment of representative wetlands (in field)
- Scope feasibility of remote sensing application to assess wetland condition/monitor wetlands
- Inclusion of recent wetland and regionally specific literature in CCMA R&D database
- Finalise fine-scale mapping and wet and dry extent mapping
- Support research that increases information on assets/threats

Action Plans developed

- Prioritise wetlands for investment at the sub-regional scale
- Conduct risk assessment on priority wetlands
- Develop and implement Action Plans
- Review and update Action Plans in conjunction with Landscape Zone Plans

Effective CWS

Project staff and partners working as a committed team

- Identify and engage agencies responsible for project delivery and approximate project costs
- Funding sources and implementation tools for wetland projects identified and accessed

Planning and Monitoring & Evaluation systems operational

- Design M&E system
- Conduct Strategy review
- Conduct regular monitoring and evaluations

APPENDIX 10 LOGISTIC FRAMEWORK FOR STRATEGIC INVESTMENT PLAN

Goal	Performance Questions and Target Indicators	Monitoring Mechanisms and Information Sources	Assumptions
Maintain the extent and enhance the quality of wetlands in the Corangamite region through a community inspired to conserve and wisely use these assets	Performance Questions: ▪ What kinds of changes have happened in the region as a result of Strategy implementation? ▪ Where has the quality of wetland assets changed and in what ways? ▪ Is there a change in the extent of wetland area? ▪ Has there been an improvement in the species populations at known sites? ▪ What is the likelihood that changes (positive/negative) would be sustained? ▪ What are the unintended impacts (positive and negative/TBL) sustained from Strategy implementation? Target Indicators: ▪ 20,000 ha of wetlands improved in quality ▪ No further reduction in extent of wetland area ▪ No additional endemic wetland dependant fauna listed as threatened (need to account for new listings)	▪ Landholder surveys (perception) ▪ General community surveys (perception) ▪ Field observations by Landholders ▪ Field observations by wetland officers ▪ Population monitoring by Threatened Species Officer (DSE) ▪ Monitoring reports (outcomes and outputs) ▪ Field assessments/surveys (other) ▪ Regional wetland inventory ▪ Condition assessments ▪ Actions for Biodiversity Conservation database (DSE) ▪ State database queries ▪ Interrogation of State mapping ▪ Covenant registers/ organisations	▪ No major commodity driven changes in land-use ▪ Better management can be used to improve wetland EVCs and wetland condition ▪ The No. of wetlands reserved in good condition is sufficient to maintain species populations ▪ Existing data on EVC and wetland extent is of sufficient quality to provide basis for decision making and monitoring ▪ Inspiration and awareness is positively linked to conservation management ▪ Impact to migratory species from external habitat quality can be appropriately factored in to survey results.

Component Objective	Performance Questions and Target Indicators	Monitoring Mechanisms and Information Sources	Assumptions
1. Improve wetland management	Performance Questions: ▪ What management innovations have been developed and promoted? ▪ What level have they been adopted at both local and regional scales/ how have wetland management practices changed? ▪ What area and percentage of the wetland asset is being used wisely? Target indicator: ▪ 20,000 ha of wetland area managed for conservation ▪ 2,000 ha of wetland area protected through conservation agreements	▪ State database queries ▪ Fauna surveys ▪ Condition assessments (IWC benchmark) ▪ Field assessments ▪ Evaluation and monitoring reports ▪ Landholder surveys ▪ Covenant documentation ▪ Site monitoring ▪ Mapping ▪ Reports, case studies ▪ Catchment Activity Management System (CAMS)	▪ There are no additional major processes such as floods, drought, catchment processes causing long-term decline, i.e. improved condition is reliant on wise use only ▪ The effects of changing management will be measurable in the timeframe ▪ Management that constitutes 'wise use' has been determined ▪ Although baseline data is of poor quality it will assist in monitoring trends and/or other mechanisms are available to monitor trends ▪ All threatened species present in the area have been identified.
Component 1. Improve wetland management – Outputs and Activities			
Outputs and Activities	Performance Questions and Target Indicators	Monitoring Mechanisms and Information Sources	Assumptions
Output 1.1 Appropriate management determined and undertaken	Performance questions: ▪ Have best management practices been determined? And how effective are they?	▪ Site visits and assessments ▪ Research results ▪ Reports ▪ Landholder reports	▪ BMPs are not static but rather should improve over time ▪ Major issues outside site management will not influence the ability of sites to improve in the long-term ▪ Surveying discrete sites will give an indication of management effectiveness ▪ Changes in health over the timeframe will be noticeable

Activities for Output 1.1	*Key Inputs*	*^Costs*	Year of implementation *(1-5)*	*Lead agency* Partner agencies	*Assumptions*
1.1.1 Establish and address R&D priorities. Incorporate in CCMA R&D Strategy and annual priority investment plan *- Desktop research on Best Management Practices* *- Ad hoc studies where appropriate*	▪ *Coordination with key regional research bodies* ▪ *Review of literature* ▪ *External research consultant* ▪ *Student support*	*$15,000 p.a.* *$5,000 p.a.*	*1* *1-5*	5 CCMA	
1.1.2 Implement existing management plans, i.e. Ramsar Site Plans, relevant Threatened Species Recovery Plans	• *Coordinate works with key agencies*	*$100,000*	*1-5*	*DSE* *PV, CCMA, Water Authorities, GAV and others*	▪ *DSE will coordinate and monitor plan implementation and therefore prioritise and approximate resource requirements for actions*
1.1.3 Develop and/or update plans for Ramsar and DIWA sites	▪ *Coordination with River Health Team*	*N/A*	*1-2*	*CCMA (DIWA)* *DSE (Ramsar)*	
1.1.4 Initiate wetland reserve schemes for inclusion as part of the National Comprehensive Reserve (CAR) Reserve system.	▪ *Conservation Reserve scheme* ▪ *Site Assessments* ▪ *Management Plans*	*$100,000*	*1-5*	*DSE*	
1.1.5 Nominate sites for significance listing	▪ *Site assessments* ▪ *Site nomination*	*$10,000*	*1-5*	*CCMA, DSE*	▪ *Inventory and condition assessment protocols will identify wetlands suitable for listing under Ramsar and DIWA criteria*
1.1.6 Increase conservation security, i.e. covenants and conservation agreements	▪ *Coordinate with TFN, DSE and Local Government*	*N/A*	*1-5*	*TFN, DSE* *CCMA, Local Govt*	▪ *Landholders will be willing to instate covenants and/or conservation agreements on their properties*

Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
Output 1.2 Land managers enabled to manage for conservation	Performance Questions: ▪ What types of skills have improved amongst land managers? ▪ How effective have land managers been in implementing management? Target Indicators: ▪ 90% compliance with management plans		▪ Land manager reports ▪ Land management overlays ▪ Report on land manager perspective ▪ Survey of land managers		▪ Once land managers have knowledge and skills associated with conservation management, they will use them. ▪ Best Practice Management is well understood and practicable ▪ Suitable resources are available for implementation.
Activities for Output 1.2	*Key Inputs*	*Costs*	*Year of implementation (1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
1.2.1 Design and implement a range of incentive schemes (i.e. MBI's, tax breaks, rate rebates, grants) *- Wetland Tender (one round)* *- BAK*	▪ *Consultant – site assessor* ▪ Administration ▪ *Advertising* ▪ *Equipment* ▪ *Coordinate with LGA's and GAV* ▪ *Evaluation of incentive scheme*	*$30,000* *$10,000* *$15,000* *$10,000* *$20,000*	*1-5*	*CCMA* *DSE, Local Govt, GAV, Landcare*	▪ *The range of incentive schemes offered will encourage a wide-range of landholders to undertake conservation practices both initially and in the longer term.*
1.2.2 Provide assistance and support to land managers	▪ *Incentive payments* ▪ *Partner schemes* ▪ *Management plans* ▪ *Rebates permanent protection*	*$200,000* *$200,000 p.a.* *$5,000 p.a.*	*1-5*	*CCMA* *LGA's, GAV*	▪ *Incentive payments and work plans will provide support* ▪ *5 yr contracts will give long term management by landholders*
1.2.3 Support EBMP and whole-farm planning	▪ *Encourage landholders to participate*	*N/A*	*1-5*	*CCMA* *DPI*	
1.2.4 Create opportunities to learn	▪ *2 Field days per year* ▪ *4 Presentations/ seminars per year*	*$3,000 p.a.* *$2,000 p.a.*	*1-5*	*CCMA, GAV*	

Activities for Output 1.2 (cont'd)	*Key Inputs*	*Costs*	*Year of implementation (1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
1.2.5 Prepare BMP guidelines and tools to facilitate wetland management. Facilitate dissemination of information to landholders	▪ *Literature review* ▪ *Printing and delivery*	*$5,000*	*1*	*CCMA*	
1.2.6 Develop and market decision making frameworks for new projects	▪ *Coordinate with govt agencies and farm industry*	*N/A*	*2*	*CCMA* *Govt agencies, SFS, Grain and Graze*	
Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
Output 1.3 Capacity of CMA, Department and Industry staff to support landholders strengthened	Performance Questions: ▪ What types of skills/knowledge have improved amongst staff? And have they used these to support land managers?		▪ Management plans ▪ Survey of industry staff ▪ Feedback from landholders		▪ If industry staff have knowledge of key contacts, they will direct land managers to them on management issues, such as grazing, weeds etc.
Activities for Output 1.3	*Key Inputs*	*Costs*	*Year of implementation (1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
1.3.1 Train field officers in the assessment of wetland systems and negotiation of conservation services	▪ *10 days training for field staff*	*$5,000*	*1*	*CCMA* *PV, DSE, GAV*	▪ *Other agencies will be interested and have time to train staff in wetland assessment*
1.3.2 Integrate with key projects in the region	▪ *Coordination and regular meetings with other agencies and programs*	*N/A*	*1-5*	*CCMA* *PV, DSE, DPI, GAV, LGA's, Landcare*	
1.3.3 Communicate enforcement capacity and responsibilities	▪ *Review of legislation and policy* ▪ *2 info product*	*$3,000* *$2,000*	*1* *2*	*CCMA Water Authorities, EPA, LGA's, DPI,*	

Activities for Output 1.3 (cont'd)	*Key Inputs*	*Costs*	*Year of implementation (1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
1.3.4 Bring stakeholders together and strengthen partnerships *- cultural heritage*	▪ *Coordination and regular meetings with other agencies and programs* ▪ *Cultural Heritage Officer support*	*$3,000*	*1-5*	*CCMA* *PV, DSE, DPI, GAV, LGA's, Aboriginal groups and Cultural Heritage Officers*	
1.3.5 Lessons learned/case studies developed	▪ *Information notes on findings from key wetland projects*	*$5,000*	*2-5*	*CCMA*	
1.3.6 Re-establish environmental flows/natural water regimes for wetland assets	▪ *Coordinate with key stakeholders to reinstate natural water regimes*	*N/A*	*1-5*	*CCMA* *DSE, Water Authorities*	
Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
Output 1.4 Improved planning and compliance with relevant legislation/best management practice	Performance Questions: ▪ What changes have occurred in wetland protection and planning procedures? ▪ What changes have occurred in the level of understanding of wetland protection mechanisms (legislative) amongst industry and community? ▪ Are available instruments being used effectively? Target Indicators: ▪ 100% of LGA's with updated planning scheme overlays/guidelines ▪ Increase in EPBC referrals associated with wetlands		▪ LGA planning overlays and guidelines ▪ Dam permit regulations and referrals ▪ Amendments to associated Legislation ▪ Agency roles and responsibilities outlined		▪ Enforcement authorities are suitably resourced to regulate activities ▪ Enforcement authorities understand their role and associated responsibility

Activities for Output 1.4	*Key Inputs*	*Costs*	Year of implementation *(1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
1.4.1 Promote ISO 14001/ best practice compliance within industry currently impacting on wetland assets	▪ *Promotion of ISO 14401 to industry which is likely to impact wetland assets*	*$10,000*	*3-5*	*CCMA* *LGA's, EPA, DSE*	
1.4.2 Mandatory EMP's for urban development and WSU design	▪ *Coordinate with LGA planning units*	*N/A*	*2*	*CCMA* *LGA's*	
1.4.3 Promote awareness of existing legislation and duty of care	▪ *Information products/campaigns*	*$10,000*	*2*	*CCMA*	
1.4.4 Improve LGA planning scheme overlays for wetland protection	▪ *Assist to revise and update planning scheme significance overlays with 9 LGA's*	*$90,000*	*2-3*	*CCMA* *LGA's*	• Improved planning controls lead to increase wetland protection
Component Objective	**Performance Questions and Target Indicators**		**Monitoring Mechanisms and Information Sources**		**Assumptions**
2. Increase public awareness of wetland benefits	Performance questions: Has community awareness of regional wetlands increased? (geological, indigenous, European, ecological etc.) (schools, youth, landholders, general community)		▪ Website counter ▪ Newspaper monitoring arrangement (media monitors) ▪ Registration at events ▪ Wetland contacts/potential projects database ▪ Requests for presentations		▪ Awareness will result in changed behaviour which in turn results in achieving the goal
Component 2. Increase public awareness of wetland benefits – Outputs and Activities					
Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
2.1 Awareness of wetlands increased	Performance Questions: ▪ What does the public know about wetlands? And who knows?		▪ Field day response ▪ Issues raised in conversation ▪ Community surveys		

Activities for Output 2.1	*Key Inputs*	*Costs*	Year of implementation *(1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
2.1.1 Community education plan		N/A	*1*	*CCMA*	
2.1.2 School education packages (primary and secondary)	▪ *Coordinate with existing programs* ▪ *Develop education packages/programs*	*$10,000*	*1-5* *2-3*	*CCMA* *GAV*	
2.1.3 Two annual wetland awareness raising events	▪ *WWD festival* ▪ *Formal fundraising event*	*$5,000 p.a.* *$8,000 p.a.*	*1-5*	*CCMA* *Local Government, GAV, PV, DSE, DPI, Landcare*	
2.1.4 Develop extension materials on wetlands - *regional icons* - *economic benefits of wetlands*	▪ *Website materials* ▪ *Brochures*	*$6,000*	*2*	*CCMA, GAV*	
2.1.5 Displays/presentations at field days	▪ *Panels/displays*	*$2,500*	*2-5*	*CCMA*	
2.1.6 Promote wetlands through tourism	▪ *Coordinate with tourism partner agencies* ▪ *Wetland guidebooks*	*$4,000*	*1-5* *3*	*CCMA* *Tourism Associations, LGA*	
2.1.7 Regular media representation of wetland projects	▪ *Media releases*	*N/A*	*1-5*	*CCMA* *DPI, Local Govt, PV, DSE, GAV*	

Component Objective	Performance Questions and Target Indicators	Monitoring Mechanisms and Information Sources	Assumptions
3. Prioritisation of regional wetlands	Performance questions: ▪ Has the ability to prioritise wetlands increased?	▪ wetland inventory database ▪ annual works plans ▪ project proposals ▪ BMP guidelines ▪ RCIP	▪ Increased knowledge leads to conservation actions and increased funding

Component 3. Prioritisation of regional wetlands – Outputs and Activities

Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
Output 3.1 Increased wetland information	Performance Questions: ▪ In what ways has wetland information increased?		▪ Wetlands database ▪ Inventory and condition assessments ▪ Wetlands Strategy ▪ Action Plans		▪ Increased knowledge and baseline data enables prioritisation and better management/investment
Activities for Output 3.1	*Key Inputs*	*Costs*	*Year of implementation (1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
3.1.1 Revision of wetland information system (current inventory database) to enable prioritisation and risk assessment capabilities *3.1.2*	• *Consultant*	*$30,000*	*1*	*CCMA*	
3.1.2 Review existing data and identify gaps	• *GIS audit and literature search*	*N/A*	*1*	*CCMA*	
3.1.3 Tools developed for assessment procedures	▪ *PDA assessment tools and mapping programs*	*$20,000*	*1*	*CCMA*	

3.1.4 Inventory of sub-regional wetlands (rolling)	• *Site assessments* • *Database analysis and report*	*$20,000*	*1-5* *5*	*CCMA*	
3.1.5 Conduct a condition assessment of representative wetlands (in field)	• Site assessments • Condition report	*$10,000*	*1-5* *2*	*CCMA*	
3.1.6 Scope feasibility of remote sensing application to assess wetland condition/monitor wetlands	• *Discussion with relevant research institutions*	*N/A*	*1*	*CCMA* *Monash University*	
3.1.7 Inclusion of recent wetland and regionally specific literature in CCMA R&D database		*N/A*	*1-5*	*CCMA*	
3.1.8 Finalise fine-scale mapping and wet and dry extent mapping	• *Consultant/student*	*$20,000*	*3*	*CCMA* *Consultant*	
3.1.9 Support research that increases information on assets/threats		*N/A*	*1-5*	*CCMA* *Research Institutions, Gov't agencies, GAV*	

Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
Output 3.2 Action Plans developed	Performance Questions: ▪ Have Action Plans been developed and effectively implemented?		▪ Annual works plans ▪ Quarterly and annual report ▪ Monitoring and evaluation reports ▪ Action Plans ▪ Reporting and evaluation		▪ Adequate funding from government is available ▪ Existing data is sufficient to provide the basis for prioritising wetlands for investment at the landscape scale ▪ Action plans remain flexible throughout review timeframes
Activities for Output 3.2	*Key Inputs*	*Costs*	*Year of implementation (1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
3.2.1 Prioritise wetlands for investment at the sub-regional scale	▪ *Data analysis* ▪ *Prioritisation framework*	*$2,000*	*1-2*	*CCMA*	
3.2.2 Conduct risk assessment on priority wetlands	▪ *Risk assessment framework*	*$30,000*	*1*	*CCMA*	
3.2.3 Develop and implement Action Plans *- Landscape Zone management unit*	▪ *Action Plans* ▪ *Consultant* ▪ *Regional workshops*	*$30,000* *$14,000* *$6,000*	*1-5*	*CCMA*	
3.2.4 Review and update Action Plans in conjunction with Landscape Zone Plans		*N/A*	*5*	*CCMA*	
Component Objective	**Performance Questions and Target**		**Monitoring Mechanisms and**		**Assumptions**

	Indicators	Information Sources	
4. Effective implementation of Corangamite Wetlands Strategy	Performance question: ▪ Has the Strategy been implemented effectively? ▪ Have targets been met? ▪ Have lessons learned been captured? ▪ Has reporting been timely and effective? Target indicator ▪ 75% of targets met	▪ Project reports ▪ Project monitoring ▪ Audits ▪ Stakeholder feedback ▪ Financial reports ▪ Variations raised ▪ Quarterly and annual reports ▪ Review processes	▪ That project systems are in place and adequate to support implementation ▪ Adequate funding is available and can be sourced for effective implementation ▪ Key stakeholders will adopt and support strategy implementation ▪ That effective implementation will lead to goal achievement

Component 4. Effective Strategy implementation – Outputs and Activities					
Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
Output 4.1 Project staff and partners working as a committed team	Performance Questions: ▪ Has sufficient funding been sourced to implement annual works plans? What are reasons for sufficient/insufficient funds? ▪ Has planning and reporting been appropriate?		▪ Annual works plans ▪ Quarterly and annual reports ▪ Monitoring and evaluation reports ▪ Action Plans ▪ Reporting and evaluation		▪ Adequate funding from government is available ▪ Existing data is sufficient to provide the basis for prioritising wetlands for investment at the landscape scale ▪ Action plans remain flexible throughout review timeframes
Activities for Output 4.1	*Key Inputs*	*Costs*	*Year of*	*Lead agency*	*Assumptions*

			implementation (1-5)	*Partner agencies*	
4.1.1 Identify and engage agencies responsible for project delivery and approx. project costs	▪ *Annual works plan* ▪ *Project Officer* ▪ *Wetlands Coordinator*	*$60,000 p.a.* *$80,000 p.a.*	*1-5*	*CCMA*	
4.1.2 Funding sources and implementation tools for wetland projects identified and accessed	▪ *Implementation tools identified* ▪ *Development of RCIP bid proposals*	*N/A*	*1-5*	*CCMA*	
Outputs and Activities	Performance Questions and Target Indicators		Monitoring Mechanisms and Information Sources		Assumptions
Output 4.2 Planning and M&E systems operational	Performance questions: ▪ Are results and recommendations of M&E being used to improve the project?		▪ Revised work plans and budgets ▪ Lessons learned ▪ Reports ▪ Evaluation report ▪ Monitoring reports		
Activities for Output 4.2	*Key Inputs*	*Costs*	*Year of implementation (1-5)*	*Lead agency* *Partner agencies*	*Assumptions*
4.2.1 Design M&E system		*N/A*	*1*	*CCMA*	
4.2.2 Conduct Strategy review		$1,000	*5*	*CCMA*	
4.2.3 Conduct regular monitoring and evaluation		*$5,000*	*1-5*	*CCMA*	
4.2.4 Report to CMA as required		*N/A*	*1-5*	*CCMA*	

^ Costs are preliminary estimates only and indicate costs for all years where the activity is to be implemented. Costing indicates predicted additional requirements to current resources, not total resources required.

APPENDIX 11 MONITORING AND EVALUATION MATRIX FOR STRATEGIC INVESTMENT PLAN

CWS Monitoring and Evaluation Matrix

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Goal: Maintain the extent and enhance the quality of wetlands in the Corangamite region through a community inspired to conserve and wisely use these assets							
To what extent has implementation of the strategy impacted on the extent of wetlands under active management in the Corangamite region	▪ Types of improvements ▪ Define active management ▪ Level of changes (increase/decrease) in the area of wetlands ▪ Where changes have occurred Reasons for changes	N/a • Current extent of wetlands – *estimated at 65,000 ha (from Wetlands_1994 data)* • *Area under management*	▪ Analysis of reports ▪ Analysis of wetland extent overlays ▪ Maps/imagery ▪ Remote sensing Landholder surveys	1 & 5	▪ CCMA ▪ DSE, CCMA ▪ DSE, CCMA ▪ CCMA, Monash University ▪ CCMA, GAV	▪ GIS mapping ▪ Landholder perception survey form	▪ Reports to investors and stakeholders ▪ Media release ▪ Future strategies
To what extent has the quality of wetlands in the Corangamite region been maintained or enhanced?	▪ Defined indices of wetland quality ▪ Level of quality changes (increase/ decrease) ▪ Where changes have occurred ▪ Reasons for changes	▪ Quality of wetlands prior to Strategy implementation – *recorded from literature, mapping and inventory*	▪ Analysis of site visits ▪ Maps/imagery ▪ Corangamite wetlands inventory and condition assessment	1 - 5 1 & 5 1 - 3	▪ CCMA, GAV, PV, DSE, Landcare ▪ DSE, CCMA ▪ CCMA	▪ GIS mapping ▪ Index of Wetland Condition metrics ▪ Wetland information system	▪ Information used to develop wetland condition report ▪ Reports to investors and stakeholders ▪ Results used to assist in the development of new projects

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Has there been a change in the species populations at known sites? *No additional endemic wetland dependant fauna listed as threatened (need to account for new listings)*	▪ Level of changes (increase/decrease) in species (native flora and fauna?) populations at known sites	▪ Population levels at known sites prior to Strategy implementation *(literature and current research projects)*	▪ Review of data from site visits and specific project/research reports ▪ Population monitoring	1 – 5 1 - 5	▪ CCMA, DSE, research institutions ▪ DSE, research institutions	▪ Victorian rare and threatened species list ▪ Reports from researchers/field monitors ▪ Actions for Biodiversity Conservation (DSE)	▪ Reports to investors and stakeholders ▪ Media release ▪ Results used to assist in the development of new projects
Component One: Improve wetland management							
What management options have been developed and promoted?	▪ Types of innovations/ practices that have been developed and recommended	N/a	▪ Annual analysis of reports ▪ Review of best management practice guidelines ▪ Landholder surveys and discussions	1 – 5 1 – 2 1 – 5	▪ CCMA ▪ CCMA, GAV, LGA's ▪ CCMA, GAV, Landcare, DSE	▪ Best management practice guidelines ▪ Information products ▪ Management plans ▪ Landholder survey format	▪ Used to determine what to promote to other landholders and projects

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
To what extent has wetland management practices been adopted by land managers?	▪ Level of adoption of different innovations ▪ Reasons for adoption or non-adoption ▪ Percent of wetlands managed appropriately ▪ Area of wetlands managed appropriately	N/a	▪ Site visits ▪ Landholder surveys and discussions ▪ Management plans ▪ Case studies ▪ Annual analysis of landholder reports ▪ Covenant registers ▪ Landholder contracts ▪ Mapping	1 – 5 1 – 5 1 – 5 1 - 5	▪ CCMA, GAV, DPI, Landcare, DSE, PV ▪ CCMA, GAV, LGA's, TFN, DSE ▪ CCMA	▪ Landholder survey format ▪ Management plan format ▪ Site assessment forms/tools ▪ Contract format ▪ GIS mapping ▪ Database reporting ▪ CAMS	▪ Reports to investors and stakeholders ▪ Results used to improve and market innovations
Component One: Improve wetland management Output 1.1: Appropriate management determined and undertaken							
What best management practices have been determined? To what extent have they been effective.	▪ Number of studies/research undertaken ▪ Types of groups that participated in the trials ▪ Effectiveness of management techniques to improve quality	N/a	▪ Annual analysis of project reports ▪ Revision of best management practices guidelines ▪ Condition/ monitoring assessments ▪ Literature review ▪ Research project development	1 – 5 1 – 5 1 & 5 1 – 5 1 & 5	▪ CCMA ▪ CCMA, GAV, LGA's ▪ CCMA, GAV, DSE ▪ CCMA ▪ CCMA, PV, DSE, research institutions		▪ Used to inform future research needs ▪ Used to determine methods to promote to landholders and other projects ▪ Used to refine management plans and best management practice guidelines

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Component One: Improve wetland management Output 1.2: Land managers enabled to manage for conservation							
To what extent are land managers in the Corangamite region implementing wetland conservation practices	▪ Types of skills that land managers have ▪ Level of skills developed (men, women, small farmers, landowners) ▪ Numbers of participating landholders with new skills ▪ Numbers of participating landholders excluded from skill development and the causes of this	▪ Skills prior to Strategy implementation – *based on landholder conversations - low in terms of knowledge of best management practice and monitoring, varying in identification skills*	▪ Workshop evaluations and attendance ▪ Landholder discussions and reports ▪ Analysis of developed material	1 – 5 1 – 5 5	▪ CCMA, GAV, Landcare ▪ CCMA, GAV, Landcare, DSE ▪ CCMA		▪ Used to improve training and determine desired training/information
How effective have land managers contracted to do conservation works been in implementing their management plans? *90% compliance with management plans*	▪ Number of sites and hectares with management plans ▪ Per cent landholder compliance with management plans	N/a	▪ Copies of landholder contracts ▪ Copies of management plans ▪ Landholder reports ▪ Site visits	1 – 5 1 – 5 1 – 5 1 - 5	▪ CCMA, GAV, LGA's, TFN, DSE ▪ CCMA, GAV, LGA's, TFN, DSE ▪ CCMA, GAV, Landcare, DSE ▪ CCMA, GAV, DPI, Landcare, DSE, PV		▪ Used to assist landholders and refine plans ▪ Used to determine landholder assistance requirements ▪ Used to improve quality and effectiveness of management plans

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Component One: Improve wetland management Output 1.3: Capacity of CMA, Department and Industry staff to support landholders strengthened							
Has the capacity of extension staff to provide advice on wetland management increased?	▪ Types of skills that staff have ▪ Level of skills developed ▪ Numbers of staff with new skills ▪ Level of adoption into 'in the field' practice ▪ Reasons for adoption or non-adoption	▪ Knowledge prior to training – *through staff survey*	▪ Staff survey ▪ Landholder feedback	1 & 5 1 - 5	▪ CCMA, GAV, DSE, DPI, PV, Landcare ▪ CCMA, GAV, DPI, Landcare, DSE, PV	▪ Staff survey format	▪ Used to improve material and messages provided to landholders ▪ Used to build skills of regional NRM staff
Component One: Improve wetland management Output 1.4: Improved planning and compliance with relevant legislation							
What changes have occurred in the level of understanding of wetland protection mechanisms (legislative) amongst industry and community?	▪ Change in level of awareness of legislative instruments for wetlands	▪ Level of awareness prior to Strategy implementation (poor – landholder conversations, dealings with staff and risk assessment process)	▪ Workshop evaluations ▪ Landholder/ industry surveys ▪ Roles and responsibilities defined	2 1 & 5 1	▪ CCMA ▪ CCMA, GAV, DSE, DPI, PV, Landcare ▪ CCMA	▪ Workshop format	▪ Used to assist in the development of information products and future workshops

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Are available instruments being used effectively? *Increase in EPBC referrals associated with wetlands*	▪ Level of enforcement	▪ Number of EPBC referrals prior to Strategy implementation – Few?	▪ Copies of EPBC referrals	1 & 5	▪ CCMA, DSE		▪ Used to improve the use of legislative instruments
Are available instruments being used effectively? *Increase in EPBC referrals associated with wetlands*	▪ Level of enforcement	▪ Number of EPBC referrals prior to Strategy implementation – *Few?*	▪ Copies of EPBC referrals	1 & 5	▪ CCMA, DSE		▪ Used to improve the use of legislative instruments
Component Two: Increase public awareness of wetland benefits							
Has community awareness of regional wetlands increased?	▪ Changes in the level of interest/awareness of wetlands	Level of awareness prior to Strategy implementation – *Med*	▪ Attendance at field days/events, enquiries ▪ Requests for information ▪ Media monitoring and website hits	1 – 5 1 – 5 1 – 5	▪ CCMA, GAV, LGA's, DSE, Landcare ▪ CCMA, GAV, DSE, PV ▪ CCMA	▪ CAMS ▪ Info request register ▪ Website counter	▪ Used to improve community engagement

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Component Two: Increase public awareness of wetland benefits Output 2.1: Awareness of wetlands increased							
What does the public know about wetlands? And who knows?	▪ Types of knowledge on wetlands ▪ Numbers of people with new knowledge ▪ Types of people with knowledge	▪ Level of knowledge prior to Strategy implementation - *Med*	▪ Participant evaluations at field days/events ▪ Analysis of material developed ▪ Community surveys	1 – 5 5 1 & 5	▪ CCMA, GAV, LGA's, DSE, Landcare ▪ CCMA ▪ CCMA, GAV, Landcare, DSE	▪ Survey form	▪ Results used to improve future community engagement and provide direction
5.1 Component Three: Prioritisation of regional wetlands							
Has the ability to prioritise wetlands increased?	▪ Level of prioritisation	▪ Ability to prioritise wetlands prior to Strategy implementation *(limited due to lack of data and coordinated analysis of existing data)*	▪ Prioritisation of regional wetlands ▪ Action Plan development	1 – 5 1 - 5	▪ CCMA ▪ CCMA	▪ Prioritisation framework ▪ Action Plan format	▪ Used to direct regional wetland investment ▪ Determine future surveys – what and when?

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Component Three: Prioritisation of regional wetlands Output 3.1: Increased wetland information							
In what ways has wetland information increased?	▪ Types of information on wetlands ▪ Reason for increase/decrease	▪ Level of wetland information prior to Strategy implementation – *(Medium, literature review – high for significant/reserved wetlands)*	▪ Research reports ▪ Literature review ▪ R&D/wetland information system database queries	1 – 5 5 1 - 5	▪ Research institutions, CMA, DSE, PV, GAV ▪ CCMA ▪ CCMA		▪ Used to assist in identifying research needs ▪ Used to assist in wetland prioritisation
Component Three: Prioritisation of regional wetlands Output 3.2: Action plan(s) developed							
Have Action Plans been developed and effectively implemented?	▪ Level of implementation ▪ Perceptions of stakeholders about the overall performance of the project	N/a	▪ Evaluations ▪ Reports	5 1 - 5	▪ CCMA ▪ CCMA, partners of funded projects		▪ Results used to ensure that Action Plans implementation is transparent ▪ Used to inform the development of future Action Plans

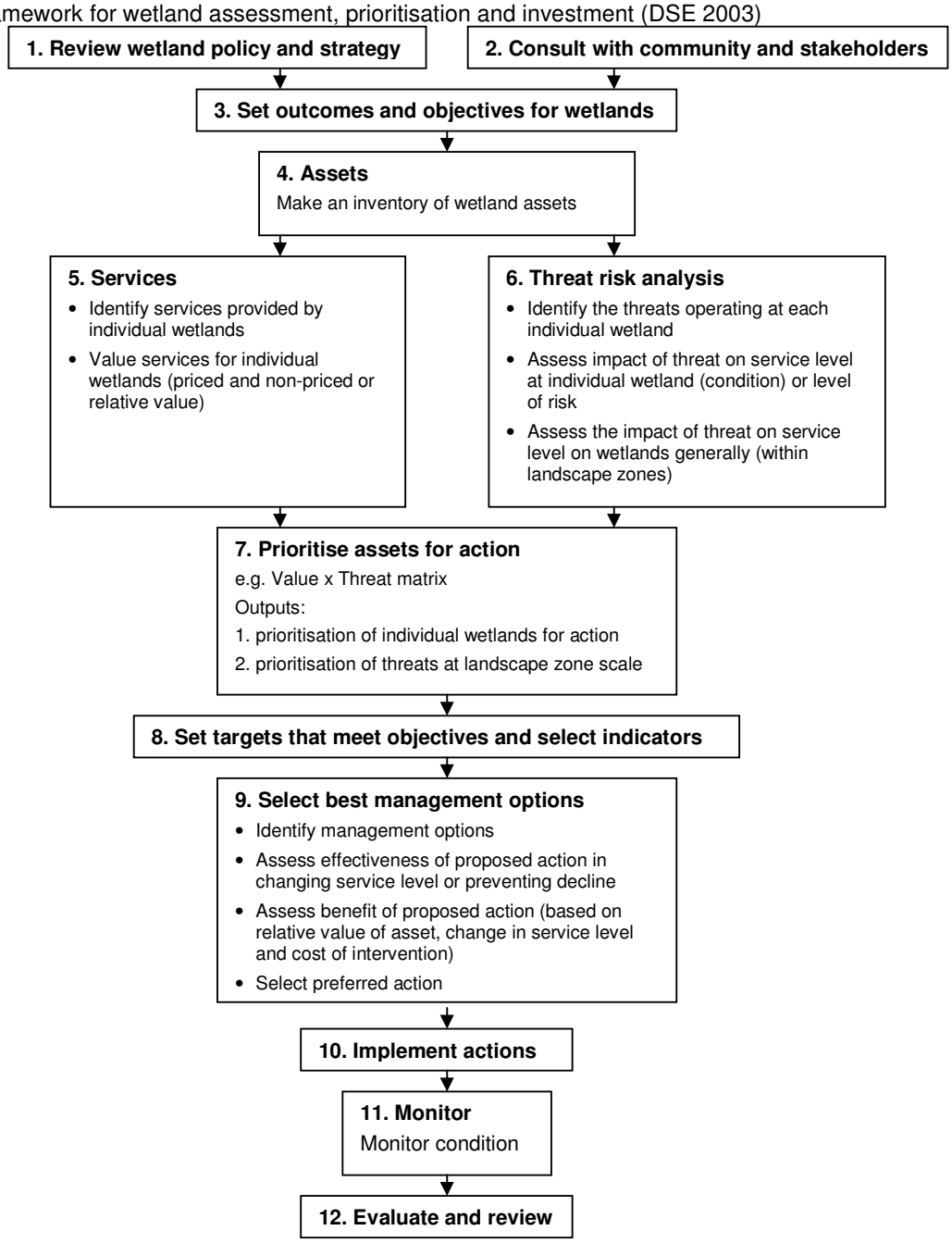
Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
5.2 Component Four: Effective Corangamite Wetlands Strategy implementation							
To what extent Has the Strategy been implemented effectively?	▪ Perceptions of stakeholders about the overall performance of the project	N/a	▪ Evaluations ▪ Reports ▪ Final questionnaire to stakeholders	5 1 – 5 5	▪ CCMA ▪ CCMA, partners of funded projects ▪ CMA	▪ Stakeholder questionnaire	▪ Results used for to ensure that Strategy implementation is transparent. Will also assist in Strategy revision
Have targets from the wetlands strategy been met? *75% of targets met*	▪ List of achievements	N/a	▪ Monthly and quarterly reporting ▪ Final evaluation	1 – 5 5	▪ CCMA ▪ CCMA	▪ Reporting formats	
Have lessons learned been captured?	▪ Types of lessons learned	N/a	▪ Analysis and reporting of results on an annual basis	1 - 5	▪ CCMA		

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Has reporting been timely and effective?	▪ Types of reports ▪ Reporting period	N/a	▪ Reports developed and accepted by CCMA managers/ investors ▪ Monthly and quarterly reports	1 – 5 1 - 5	▪ CCMA ▪ CCMA	▪ Monthly/quarterly report format	
Component Four: Effective Strategy implementation Output 4.1: Project staff and partners working as a committed team							
To what extent has implementing the strategy lead to effective partnerships for wetland conservation	▪ Level of funding/implementation ▪ Who has secured funding ▪ Reasons for sufficient/insufficient funding	N/a	▪ Preparation of RCIP bids ▪ Evaluation ▪ Annual works plan ▪ Monthly reporting (budgets)	1 – 5 5 1 – 5 1 - 5	▪ CCMA, project partners ▪ CCMA ▪ CCMA ▪ CCMA	▪ RCIP template ▪ Monthly report format ▪ Annual works plan format	▪ Results used for to ensure that Strategy implementation is transparent. Will also assist in Strategy revision
	▪ Types of plans and reports developed	N/a	▪ Reports developed and accepted by CCMA managers/ investors ▪ Monthly and quarterly reports	1 – 5 1 - 5	▪ CCMA ▪ CCMA	▪ Monthly/quarterly reporting format ▪ Activity reporting format	

Performance questions and related targets	Information needs and indicators	Baseline information: requirements and status	Data gathering: methods	Frequency (Yrs 1- 5)	Responsibility	Planning and resources: forms, planning, training, data management, expertise	Information use: analysis, reporting, feedback, change processes
Component Four: Effective Strategy implementation Output 4.2: Planning and M&E systems operational							
Are results and recommendations of M&E being used to improve the Strategy?	▪ Types of improvements made to the Strategy	N/a	▪ Mid-term evaluation	2 - 3	▪ CCMA	▪ Internal team for mid-term evaluation	▪ Identification of necessary changes and options to improve Strategy.

APPENDIX 12 FRAMEWORK FOR WETLAND PRIORITISATION AND EXPLANATORY NOTES

Framework for wetland assessment, prioritisation and investment (DSE 2003)



Explanatory notes to accompany the wetland prioritisation framework (DSE 2003).

Step	Relevant Plans	Useful tools to help implement the framework
1. Review wetland policy and strategy	Wetlands Policy Framework (interim policy/strategy summary) RCS and subsidiary strategies	International, national and State policy/strategy/legislation Regional policy/strategy
2. Consultation	RCS and subsidiary strategies	
3. Set outcomes and objectives	RCS and subsidiary strategies	
4. Assets	CMA wetlands inventory	Define wetlands (Ramsar Convention definition) Describe Victorian classification Use DSE CGDL layer WETLAND_1994 as basis of inventory Add other wetlands not covered by Victorian classification
5. Services Asset valuation	RCS and subsidiary strategies RCS and subsidiary strategies	See summary of wetlands services (environmental/economic/social) – identify what services and values are applicable to the individual wetland.
6. Threat Risk Analysis Identify threats operating at each individual wetland Assess impact of threats at individual wetlands Assess impact of threats on wetlands generally	RCS and subsidiary strategies RCS and subsidiary strategies RCS and subsidiary strategies	See summary of wetland threats. May choose to do this in a staged way so that priority actions can be quickly identified for a set of wetlands: *i.e.* initially analyse threats for known high value wetlands, later complete process for other wetlands The condition of a wetland indicates impact of the threat on its service levels. No impact may yet have occurred but level of risk of impact may be present. It is important to identify widespread threats that affect many wetlands.
7. Prioritise assets for action Prioritise wetlands on basis of valuation	RCS and subsidiary strategies	Need to develop methodology to assign priority: *e.g.* does a high value wetland with low risks get priority over a medium value wetland with high risks? As an alternative to systematically identifying and comparing wetland values, region may choose to accept prioritisation as follows (but this is primarily a biodiversity value prioritisation and does not necessarily consider economic and social vales) Ramsar Sites Wetlands listed in 'A Directory of

Step	Relevant Plans	Useful tools to help implement the framework
		Important Wetlands in Australia' Wetlands of bioregional significance as per National Land and Water Resource Audit criteria.
Prioritise threats on a landscape basis	RCS and subsidiary strategies	As a preliminary alternative to a systematic analysis of threat at individual wetlands could use existing data on factors such as water table depth (indicator of salinity), land tenure (indicator of grazing). Threats that affect many wetlands across a broad area would have priority over local threats that affect few wetlands.
List of priority threats for action	RCS and subsidiary strategies RCIP	Threats that affect many wetlands across a broad area would have priority over local threats that affect few wetlands.
List of priority wetlands for action	Regional Catchment Investment Plan (RCIP)	
8. Set targets that meet objectives	RCS and subsidiary strategies	
9. Select best management options Identify management options		
Assess effectiveness of action in changing service level or preventing decline	RCIP	Need criteria to assess proposed management action: • addresses cause vs effect • operates quickly enough to arrest decline in asset • temporary vs lasting solution • proven vs experimental approach • provides multiple benefits • minimises impacts on other services provided by asset in question or on other assets • skills/knowledge available to implement
Assess benefit of action	RCIP	Need criteria to assess benefit: • relative value of asset services • change in service level predicted • cost of action
Select preferred action	RCIP	Preferred actions should be those that deliver greatest integrated benefit in terms of addressing risks to multiple services.
10, 11 and 12. Implement, monitor (condition), evaluate, review	CMA reporting framework and RCS review.	DSE will lead development of state framework for monitoring condition of wetlands.