



Australian Government

**Department of Sustainability, Environment,
Water, Population and Communities**

Corner Inlet Ramsar site

Ecological Character Description

June 2011

Chapters 1-2

Other chapters can be downloaded from:

www.environment.gov.au/water/publications/environmental/wetlands/13-ecd.html

1 INTRODUCTION

1.1 Background

The Corner Inlet Ramsar site, which covers 67 186 hectares, is located approximately 200 kilometres south-east of Melbourne and is the most southerly marine embayment and intertidal system of mainland Australia (Figures 1-1, 1-2 and 1-3). Corner Inlet is one of 64 wetland areas in Australia that have been listed as a Wetland of International Importance under the *Convention on Wetlands of International Importance especially as Waterfowl Habitat* or, as it is more commonly referred to, the Ramsar Convention (the Convention). Corner Inlet was listed as a Ramsar site under the Convention in December 1982 in recognition of its outstanding coastal wetland values and features.

The Convention sets out the need for contracting parties to conserve and promote wise use of wetland resources. In this context, an assessment of ecological character of each listed wetland is a key concept under the Ramsar Convention. Under Resolution IX.1 Annex A: 2005, the ecological character of a wetland is defined as:

The combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time.

The definition indicates that ecological character has a temporal component, generally using the date of listing under the Convention as the point for measuring ecological change over time. As such, the description of ecological character should identify a wetland's key elements and provide an assessment point for the monitoring and evaluation of the site as well as guide policy and management, acknowledging the inherent dynamic nature of wetland systems over time.

This report provides the ECD for the Corner Inlet Ramsar site. In parallel with the preparation of the ECD, the Ramsar Information Sheet (RIS) for the site is being updated for submission to the Australian Government and Ramsar Secretariat.

The report has been prepared in accordance with the requirements of the *National Framework and Guidance for Describing the Ecological Character of Australia's Ramsar Wetlands* (DEWHA 2008) (hereafter referred to as the National ECD Framework). Further information about the requirements of the Framework is contained in Section 1.2.

This ECD report has been prepared over a period of six months by the consultant study team led by BMT WBM Pty Ltd under contract with DSEWPAC. This has occurred with input from a Project Steering Committee made up of officials from DSEWPAC, the Victorian Department of Sustainability and Environment (DSE), Parks Victoria, the Gippsland Coastal Board (GCB), the Department of Defence (DoD) and the West Gippsland Catchment Management Authority (WGCMA) (see Appendix A).

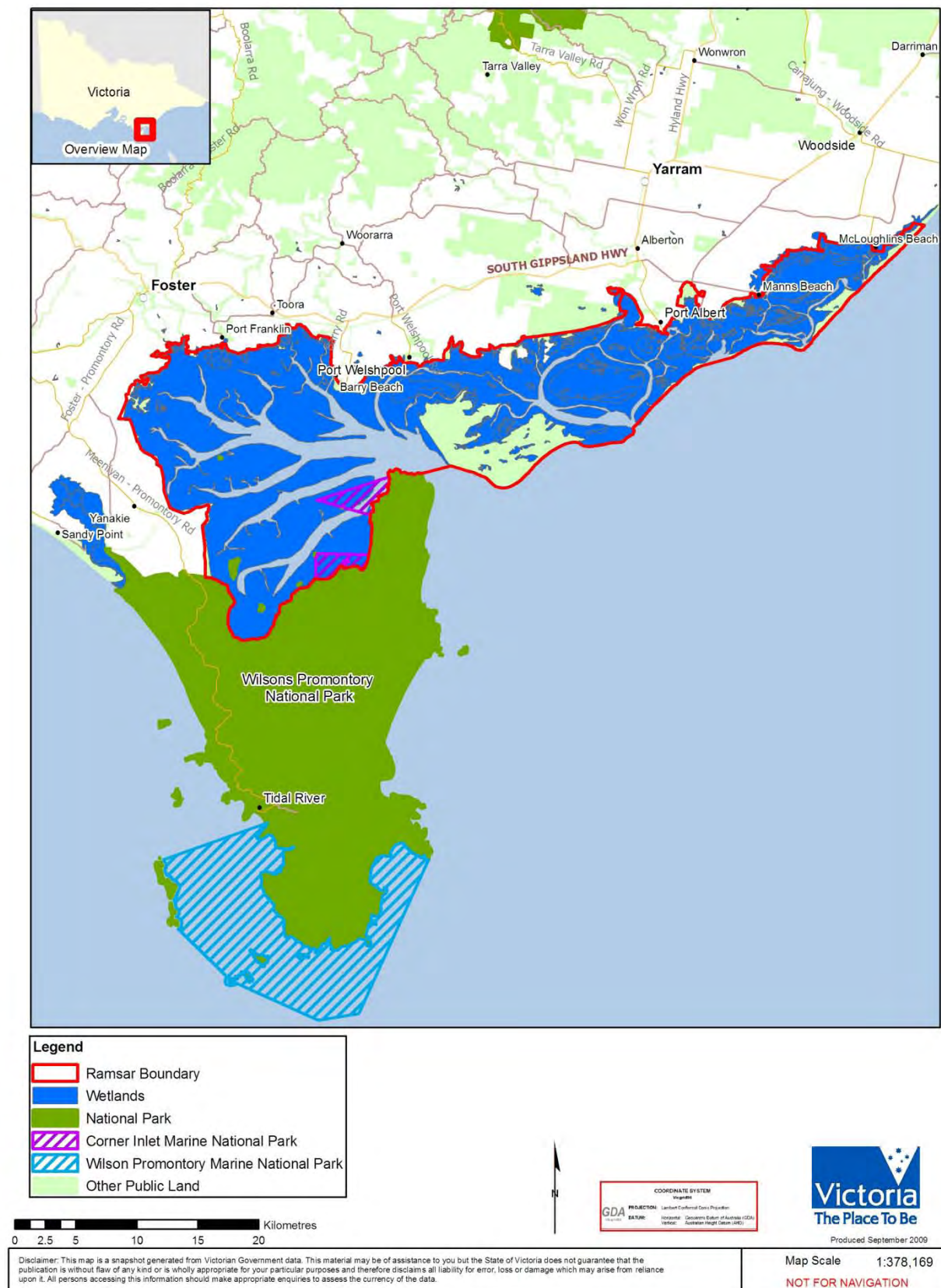
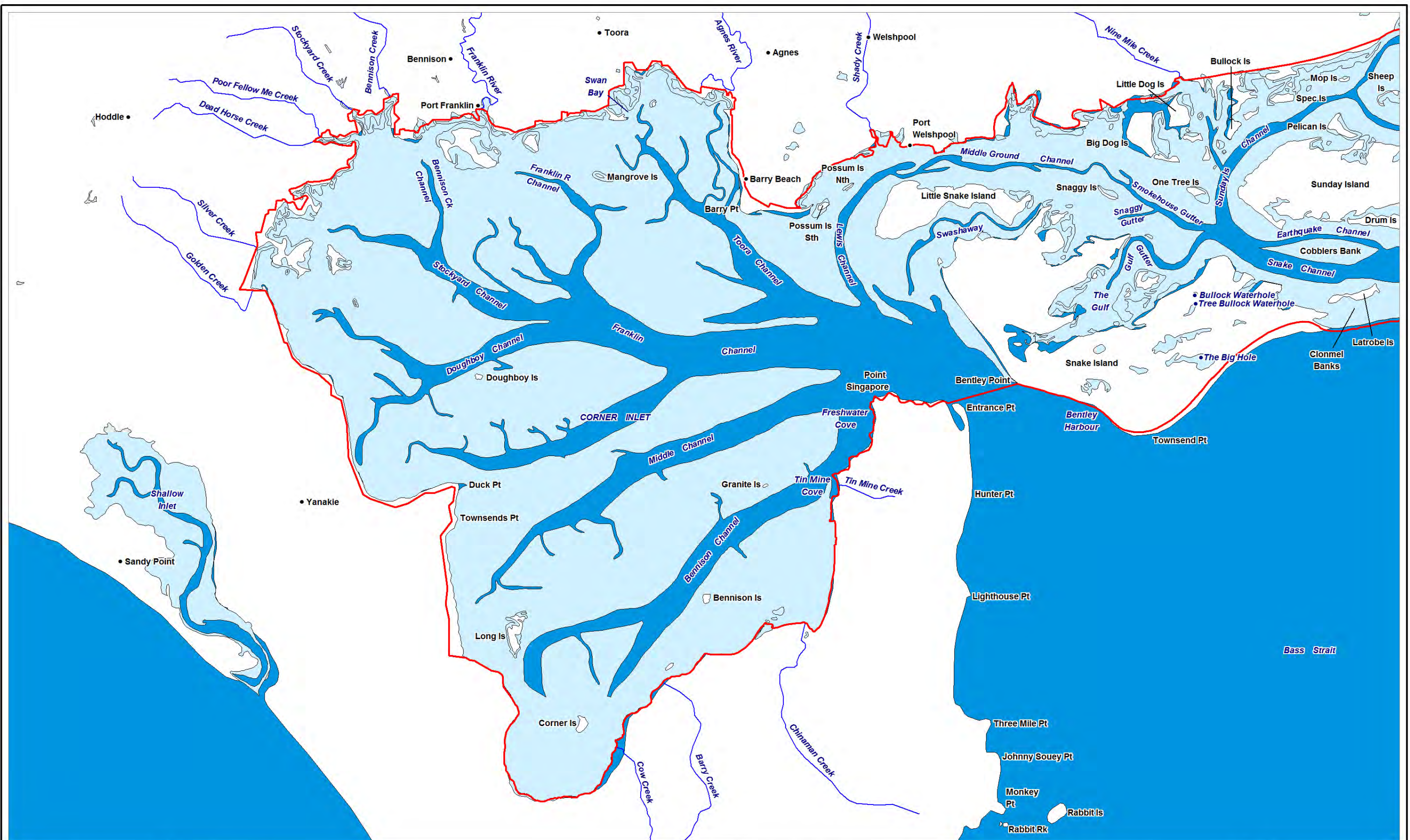


Figure 1-1 Locality plan showing key locations referred to in this document (Source: DSE unpublished)



Title:
Locality Plan Showing Western Portion of the Site

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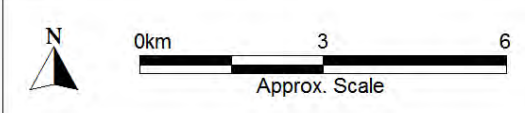


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LEGEND



Corner Inlet RAMSAR Site

Title:

Locality Plan Showing Eastern Portion of the Site

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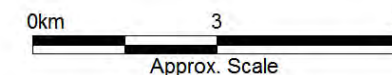


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1.2 Scope and Purpose

Figure 1-4 shows the key steps of the ECD preparation process from the National ECD Framework document which forms the basis for ECD reporting.

Based on the National ECD Framework (DEWHA 2008), the key purposes of undertaking an ECD are as follows:

1. *To assist in implementing Australia's obligations under the Ramsar Convention, as stated in Schedule 6 (Managing wetlands of international importance) of the Environment Protection and Biodiversity Conservation Regulations 2000 (Commonwealth):*
 - a) *to describe and maintain the ecological character of declared Ramsar wetlands in Australia*
 - b) *to formulate and implement planning that promotes:*
 - i) *conservation of the wetland*
 - ii) *wise and sustainable use of the wetland for the benefit of humanity in a way that is compatible with maintenance of the natural properties of the ecosystem.*
2. *To assist in fulfilling Australia's obligation under the Ramsar Convention, to arrange to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the Ramsar List has changed, is changing or is likely to change as the result of technological developments, pollution or other human interference.*
3. *To supplement the description of the ecological character contained in the Ramsar Information Sheet submitted under the Ramsar Convention for each listed wetland and, collectively, to form an official record of the ecological character of the site.*
4. *To assist the administration of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), particularly:*
 - a) *to determine whether an action has, will have or is likely to have a significant impact on a declared Ramsar wetland in contravention of sections 16 and 17B of the EPBC Act, or*
 - b) *to assess the impacts that actions referred to the Minister under Part 7 of the EPBC Act have had, will have or are likely to have on a declared Ramsar wetland.*
5. *To assist any person considering taking an action that may impact on a declared Ramsar wetland whether to refer the action to the Minister under Part 7 of the EPBC Act for assessment and approval.*
6. *To inform members of the public who are interested generally in declared Ramsar wetlands to understand and value the wetlands.*

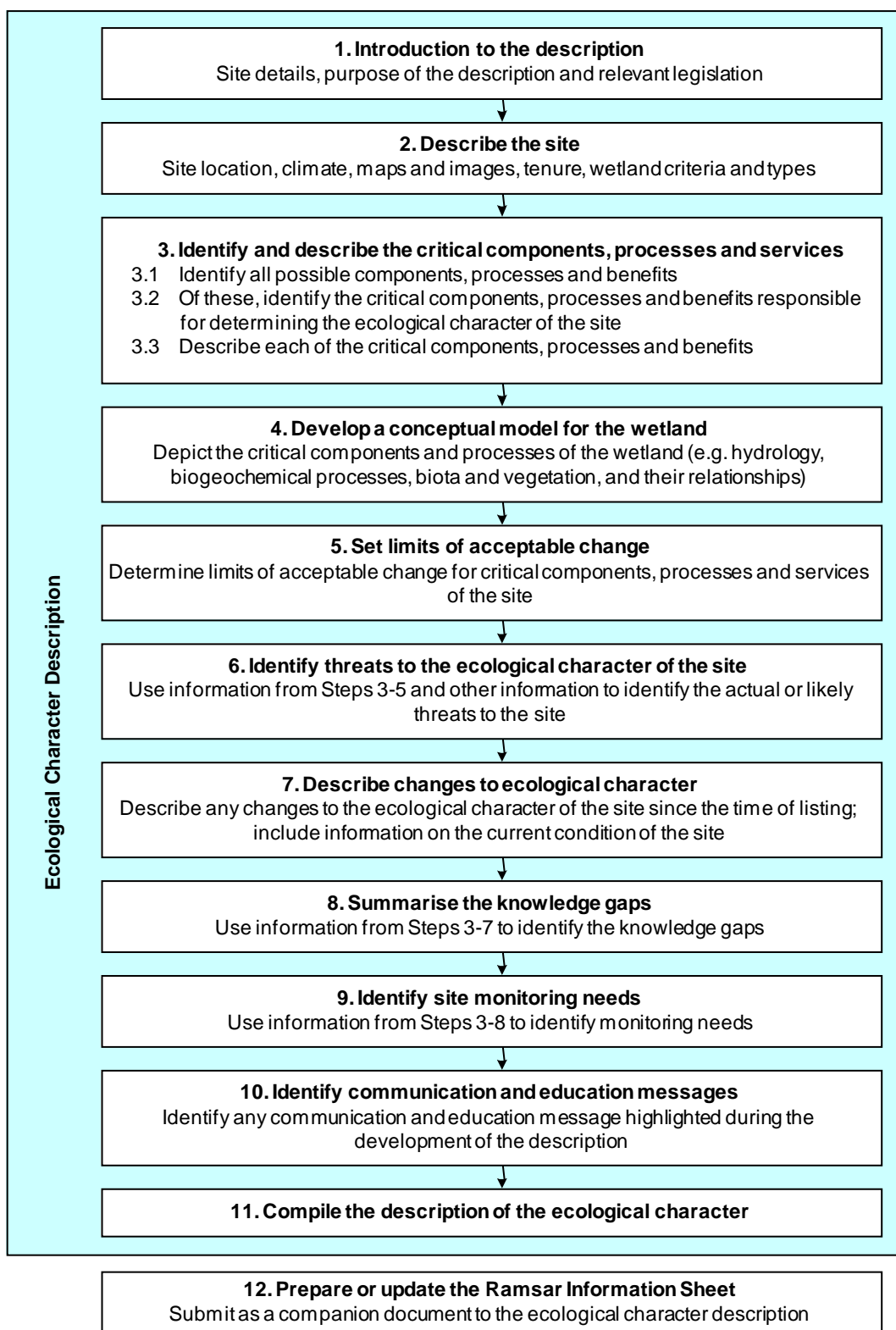


Figure 1-4 Key steps in preparing an Ecological Character Description

(Source: National ECD Framework, DEWHA 2008)

1.3 Relevant Treaties, Legislation and Regulations

This section provides an overview of the treaties, legislation and regulations at various levels of government relevant to the Corner Inlet Ramsar site.

1.3.1 Australian Government Legislation or Policy Instruments

International - Ramsar Convention

The Convention on Wetlands of International Importance (Ramsar, Iran, 1971) or as it is more commonly known, the Ramsar Convention, is an intergovernmental treaty dedicated to the conservation and sustainable use of wetlands (EA 2001). Australia was one of the first 18 countries to become a signatory to the Convention in 1971 and the Convention entered into force in Australia in 1974. The Ramsar Convention Secretariat maintains a List of Wetlands of International Importance that includes 64 existing Australian sites.

Australia's obligations to protect and maintain the ecological character of its Ramsar sites is recognised in Commonwealth Legislation through the EPBC Act.

Ramsar Wetlands and the EPBC Act

Under the EPBC Act (refer s16) an action that has, will have, or is likely to have, a significant impact on the ecological character of a Ramsar wetland (one of the eight matters of National Environmental Significance), must be referred to the Australian Government Minister for Environment and undergo an environmental assessment and approval process. EPBC Act Policy Statements provide specific guidance to help assess the significance of an action. An action is likely to have a significant impact on the ecological character of a Ramsar wetland if there is a real chance or possibility that it will result in:

- areas of the wetland being destroyed or substantially modified
- a substantial and measurable change in the hydrological regime of the wetland - for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland
- the habitat or lifecycle of native species dependent upon the wetland being seriously affected
- a substantial and measurable change in the physico-chemical status of the wetland - for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health
- an invasive species that is harmful to the ecological character of the wetland being established in the wetland.

The EPBC Act also established a framework for managing Ramsar wetlands, through the Australian Ramsar Management Principles set out in the *Environment Protection and Biodiversity Conservation Regulations 2000* (see DEWHA 2008).

International Conventions on Migratory Species

Australia is a signatory to four international conventions on migratory species. The conventions are:

- The Convention on Migratory Species (CMS) also known as the Bonn Convention.
- The Japan-Australia Migratory Birds Agreement (JAMBA).
- The China-Australia Migratory Birds Agreement (CAMBA).
- The Republic of Korea-Australia Migratory Birds Agreement (ROKAMBA).

Convention on Migratory Species (CMS)

The CMS was adopted in 1979 and aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, under the United Nations Environment Program, concerned with the conservation of wildlife and habitats on a global scale.

Japan-Australia Migratory Birds Agreement (JAMBA), China-Australia Migratory Birds Agreement (CAMBA) and Republic of Korea-Australia Migratory Birds Agreement (ROKAMBA)

JAMBA and CAMBA are bilateral agreements between the governments of Japan and Australia and China and Australia, which seek to protect migratory birds listed in the two agreements. The two agreements list terrestrial, water and shorebird species that migrate between Australia and the respective countries. In both cases the majority of listed species are shorebirds. Both agreements require the parties to protect migratory birds from take or trade except under limited circumstances, protect and conserve habitats, exchange information, and build cooperative relationships. The JAMBA agreement also includes specific provisions for cooperation on conservation of threatened birds.

In April 2002, Australia and the Republic of Korea also signed a bilateral migratory bird agreement similar to the JAMBA and CAMBA. The ROKAMBA agreement obliges its Parties to protect bird species which regularly migrate between Australia and the Republic of Korea, and their environment. The Annex to the ROKAMBA contains the list of species or subspecies of birds for which there is reliable evidence of migration between the two countries.

EPBC Act and protection of species listed under international conventions

The particular species that are the subject of the agreements or conventions are listed as migratory species under the EPBC Act, and thus are considered to be a matter of National Environmental Significance. Therefore, any action or potential action that may affect these species or species listed as rare or threatened must be referred to the Australian Government Minister for the Environment for assessment. The Minister will decide whether the action will, or is likely to, have a significant impact on the listed species and whether the action will require approval under the EPBC Act. If approval under the EPBC Act is required, then an environmental assessment of the action must be carried out. The Minister decides whether to approve the action, and what conditions (if any) to impose, after considering the environmental assessment.

1.3.2 Victorian Government Legislation or Policy Instruments

Catchment and Land Protection Act 1994

Under the Act, Victoria is divided into ten catchment regions, and a Catchment Management Authority (CMA) is established for each region. CMAs form a major part of the framework for achieving sustainable management of Victoria's land and water resources.

Coastal Management Act 1995

The Act was enacted to establish the Victorian Coastal Council, provide for the establishment of Regional Coastal Boards and co-ordinate strategic planning and management for the Victorian coast. It also provides for the preparation and implementation of management plans for coastal Crown land and a co-ordinated approach to approvals for the use and development of coastal Crown land.

The Act aims to plan for and manage the use of Victoria's coastal resources on a sustainable basis for recreation, conservation, tourism, commerce and similar uses in appropriate areas while protecting and maintaining areas of environmental significance on the coast including its ecological, geomorphological, geological, cultural and landscape features. The Act also aims to facilitate the development of a range of initiatives that improve recreation and tourism, to maintain and improve coastal water quality, to improve public awareness and understanding of the coast and to involve the public in coastal planning and management.

Crown Land (Reserves) Act 1978

This Act provides for reservation of Crown Land Reserves for a variety of public purposes, the appointment of committees of management to manage reserves and for leasing and licensing of reserves for purposes approved by the Minister administering the Act.

Environmental Protection Act 1970

This Act establishes the Environment Protection Authority and makes provision for the Authority's powers, duties and functions. These relate to improving the air, land and water environments by managing waters, control of noise and control of pollution. The Act provides for a 'works approval' process for actions that may lead to water, noise and air pollution, in addition to the usual planning permit requirements or where the planning scheme may not apply.

State Environment Protection Policies (SEPPs) are subordinate legislation made under the provisions of the Act to provide more detailed requirements and guidance for the application of the Act to Victoria. The SEPPs aim to safeguard the following environmental values and human activities (beneficial uses) that need protection in the State of Victoria from the effect of waste:

- human health and well-being
- ecosystem protection
- visibility
- useful life and aesthetic appearance of buildings, structures, property and materials

- aesthetic enjoyment and local amenity.

Fisheries Act 1995

The Act provides a legislative framework for the regulation, management and conservation of Victorian fisheries including aquatic habitats. The Fisheries Act seeks to protect and conserve fisheries resources, habitats and ecosystems, including the maintenance of aquatic ecological processes and genetic diversity and at the same time promote the sustainable use of those resources.

Flora and Fauna Guarantee Act 1988

The Act provides a legislative and administrative framework for the conservation of biodiversity in Victoria. The Act provides for the listing of threatened taxa, communities and potentially threatening processes. It requires the preparation of action statements for listed species, communities and potentially threatening processes and sets out the process for implementing interim conservation orders to protect critical habitats. The Act also seeks to provide programs for community education in the conservation of flora and fauna and to encourage co-operative management of flora and fauna.

National Parks Act 1975

The Act provides for the establishment and management of national, State and other parks in Victoria to preserve and protect natural values and provide for their public use and enjoyment. Based on information from the National Park Act Annual Report 2009, there are 133 managed areas covering a total of over 3.32 million hectares.

Planning and Environment Act 1987

The *Planning and Environment Act 1987* is the basis for the direction and control of land use and development in Victoria. Under the Act planning schemes are required which set out policies and provisions for the use, development and protection of land for local government areas. Each municipality in Victoria is covered by a planning scheme. Planning schemes provide local councils with the means of controlling land use and development to protect wetlands and waterways. These are legal documents prepared by the local council or the Minister for Planning, and approved by the Minister.

The State Planning Policy Framework states that: "Planning and responsible authorities must ensure that any changes in land use or development would not adversely affect the habitat values of wetlands and wetland wildlife habitats designated under the Convention on Wetlands of International Importance".

Water Act 1989

The *Water Act 1989* establishes rights and obligations in relation to water resources and provides mechanisms for the allocation of water resources (the 'bulk entitlement' process). This includes the consideration of environmental water needs of rivers and wetlands as well as for human uses such as urban water supply and irrigation.

Waterway management and general river health management is the responsibility of Catchment Management Authorities and Melbourne Water (Part 10 of the Act).

The Act also provides for the establishment of an Environmental Water Reserve (EWR). The EWR can be held in storage and released to a river, it can be run-of-river flow and it can be groundwater. The EWR is defined in section 4A of the Water Act and comprises water set aside for the environment through:

- environmental entitlements
- bulk entitlements held by the Minister for Environment
- conditions on bulk entitlements and water licences
- provisions in Water Supply Protection Area management plans
- any other provision of the *Water Act 1989* or regulations, including for example permissible consumptive volumes.

Wildlife Act 1975

The purposes of this Act are to protect and conserve wildlife, prevent wildlife taxa from becoming extinct, promote the sustainable use of and access to wildlife, and to manage activities concerning or related to wildlife. The Act regulates the protection, management and use of wildlife.

2 SITE DESCRIPTION

2.1 Description of the Site

2.1.1 General Features of the Site and Surrounds

Corner Inlet Ramsar site is located approximately 200 kilometres south-east of Melbourne and is the southern-most marine embayment and intertidal flat location on mainland Australia. The site is located at latitude 38 degrees south within the temperate *warm summer – cool winter* climatic zone (Bureau of Meteorology 2011). A locality map of Corner Inlet is shown in Figure 1-1. Summary details of the site for the purposes of the ECD are provided in Table 2-1. The broad study region for this ECD includes the marine waters and foreshores of Corner Inlet, its sand barrier islands and adjoining catchment areas. The Inlet is bounded by:

- the South Gippsland coastline to the west and north
- a series of barrier islands, sandy spits and Bass Strait to the south-east
- the hills of Wilsons Promontory to the south.

The site and its catchment areas are a component of the broader West Gippsland Catchment Management Authority (WGCMA) region, which is legislatively defined by the *Victoria Catchment and Land Protection Act 1994*. The WGCMA region has an area of 17 164 square kilometres (almost eight per cent of Victoria's total area), and extends from the Gippsland Lakes to west of Warragul, and from the Great Dividing Range to Wilsons Promontory.

Guidelines under the Ramsar Convention favour the use of international or national biogeographic regions in the context of interpretation of Ramsar Nomination criteria and other aspects of the Convention. Different biogeographic schemes apply to the site, depending on whether marine, terrestrial/freshwater environments are considered. In this context, Corner Inlet occurs within the following biogeographic regions:

- for marine areas (IMCRA v4.0) – the Southeast IMCRA Transition Bioregion
- for freshwater and terrestrial areas (Australian Drainage Divisions) – the Southeast Coast Drainage Division.

The site is essentially one large area of marine embayment, tidal channels and sandy barrier islands that includes: marine/estuarine areas within Corner Inlet; land areas (above the high water mark) covering the sand islands and spits along the south eastern site boundary; and nearshore coastal areas fringing the mainland (see Figures 1-1, 1-2, 1-3). The site excludes most of the rivers and creeks that flow into the Inlet from the mainland catchments, but does include river and creek mouths. Mainland drainages that flow into the site include (counter-clockwise from northern tip of the site): Bruthen Creek, Neils Creek, Tarra River, Albert River, Muddy Creek, Nine Mile Creek, Shady Creek, Agnes River, Franklin River, Bennison Creek, Stockyard Creek, Poor Fellow Me Creek, Dead Horse Creek, Silver Creek, Golden Creek, Cow Creek, Barry Creek, Chinaman Creek and Tin Mine Creek (Figures 1-1, 1-2, 1-3). Drainages and other freshwater wetland systems on the sand barrier islands are also included in the site.

Table 2-1 Summary of Key Features of the Corner Inlet Ramsar Site

Attribute	Description
Ramsar Site Name and Number	Corner Inlet, Victoria; Site No. 261
Location in Coordinates	Latitude: 38° 36' to 38° 55'S Longitude: 146° 11' to 146° 53'E
Biogeographic Region	Marine areas (IMCRA v4.0) – Southeast IMCRA Transition Bioregion. Freshwater and terrestrial areas (Australian Drainage Divisions and River Basins) – South Gippsland Basin (South-east Coast Division).
Area	67 186 hectares
Date of Ramsar Site Designation	15 December 1982
Date the Ecological Character Description Applies	1982 (time of listing); 2011 (time of preparation of the ECD)
Status of Description	This is the first ECD undertaken for the site.
Date of Compilation	March 2011
Compiler's Name	BMT WBM Pty Ltd, with expert input from Austecology Pty Ltd and Dodo Environmental, under contract with DSEWPAC
Ramsar Information Sheet	Last updated 1999 (by Parks Victoria). Refer to Ramsar sites information service, Ramsar sites database: http://ramsar.org/ris/key_ris_index.htm Ramsar Site No.: 261 Wetlands International Site Reference No.: 5AU013 RIS updated as part of current ECD by BMT WBM (2011).
Management Plan	The main management plan for the site is the Corner Inlet Ramsar Site Strategic Management Plan (Department of Sustainability and Environment 2002). Other relevant statutory plans include: <ul style="list-style-type: none"> • Corner Inlet Marine National Park Management Plan (Parks Victoria 2005) • Corner Inlet and Nooramunga Marine and Coastal Park Draft Management Plan (1996) • Wilsons Promontory National Park Management Plan (2002) • West Gippsland Fishery Management Plan 2008 (Department of Primary Industries 2008)
Management Authority	The Ramsar site predominantly includes Victorian waters that are contained within Corner Inlet Marine and Coastal Park, Nooramunga Marine and Coastal Park and Corner Inlet Marine National Park. These areas are managed by Parks Victoria under the provisions of the <i>National Parks Act and Regulations</i> . Land areas above high water mark on Doughboy Island, Bennison Island, Granite Island, Long Island and Corner Island, together with the intertidal area in the southern section of Corner Inlet, form part of Wilsons Promontory National Park. The Park is managed by Parks Victoria under the provisions of the <i>National Parks Act and Regulations</i> . The barrier islands are part of the Nooramunga Wildlife Reserve managed by Parks Victoria under the <i>Wildlife Act</i> but will be incorporated into Nooramunga Marine and Coastal Park when the park is permanently reserved. Other mainland areas of Crown Land will also be incorporated into the park when it is permanently reserved.

Attribute	Description
	<p>Land and waters within Port areas (Port Welshpool and Port Albert) are managed by Gippsland Ports under the <i>Crown Land Reserves Act</i>.</p> <p>Parts of Sunday Island, Dog Island, Little Dog Island, Hunter Island and Bullock Island are privately owned and managed as grazing properties. The remaining areas of the Ramsar site are either freehold land, unreserved Crown Land or are included in various public purposes or coastal reserves.</p> <p>In addition, the Department of Environment and Sustainability is a lead agency for planning and management of wetlands in Victoria, and other State and local agencies also play a cooperative role in the management of wetland resources within and adjacent to the site.</p>

The site is an open marine/coastal system and contains a range of species that have a wide home range that extends to other areas outside the site boundaries. Consequently, many of the more mobile species (particularly migratory birds and many fish species) will only use the areas within the site from time to time. Likewise, threats and controls on these species and habitats may also be occurring outside the boundaries of the site, and as such, maintenance of ecological character can be highly reliant on other conservation and management regimes.

2.1.2 Overview of Wetland Types

2.1.2.1 Information Sources

The Corner Inlet Ramsar site is composed of a complex network of coastal wetland types. Wetland types present range from intertidal marshes and forests, to intertidal flats, sandy shores and subtidal aquatic beds. For this report, the Ramsar Classification System for Wetland Types (approved by Recommendation 4.7 and amended by Resolutions VI.5 and VII.11 of the Conference of the Contracting Parties) has been adopted.

The 1982 nomination RIS (Victorian Ministry for Conservation 1980) specifically identifies the following wetland types as being represented at the time of site listing:

- type A - Permanent shallow marine waters typically less than six metres at low tide; includes sea bays and straits
- type G - Intertidal mud, sand or salt flats
- type H - Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes
- type I - Intertidal forested wetlands; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.

Victorian Ministry for Conservation (1980) also notes that the site supported extensive seagrass meadows, which is the equivalent to wetland type B.

To date, no mapping according to Ramsar wetland typology has been undertaken for Corner Inlet, either prior to or after Ramsar site declaration. However, some of the Ramsar wetland types are

analogous to habitat types used in other mapping programs. Key data sources that document wetland types at the time of site listing include:

- Victorian Wetlands Database (1994). This database maps habitat types according to the Victorian Wetland Classification Scheme (VWCS), which is based on the scheme developed by Corrick and Norman (1980)
- Morgan (1986). This study documented seagrass, saltmarsh, mangroves and macrobenthos communities in Corner Inlet in 1983–1984. Broad-scale mapping of *Posidonia* seagrass was undertaken.

More recent studies, together with high level analysis undertaken in this report, identify wetland types presently represented in the site. Of particular note is Ecological Vegetation Class (EVC) mapping (2005; Figure 2-2), seagrass assessments undertaken by Roob *et al.* (1998), and the environmental inventory undertaken by Plummer *et al.* (2003). These data sources have been considered for this report in order to determine Ramsar wetland types present within the site.

Although there are few direct overlaps in the wetland typologies used in the EVC, VWCS and Ramsar wetland classification systems, the most likely equivalent wetland types were determined and are presented in Table 2-2. Using the VWCS mapping, a map of broad wetland types within the Ramsar site was generated (refer Figure 2-1) and areas of each wetland type were calculated (refer Table 2-2) using equivalent Ramsar wetland types.

Based on VWCS mapping and other information sources, fourteen Ramsar wetland types are considered to have been represented at the site at the time of listing, and continue to be supported at present (Table 2-2). In addition to the five wetland types outlined in the Victorian Ministry for Conservation (1980) (Types A, B, G, H and I), at least five other marine/coastal Ramsar wetland types (Types D, E, F and K) and four inland Ramsar habitat types (Types N, Tp, Ts, W and Xf) are presently represented in the site. Further details and descriptions of these wetland types are provided below. Note that there are some uncertainties regarding the extent and distribution of most wetland types due to the lack of a consistent, systematic mapping of Ramsar wetland habitat types within the site. Where such uncertainties exist, these have been identified in the following sections.

Table 2-2

Ramsar Wetland Types, as translated from the Victorian Wetland Classification System (VWCS) Wetland Types, within the Ramsar site

Wetland Type	Time of listing			Present day	Representative examples
	Interpreted VWCS Category	VWCS Area (hectares)	Other Sources		
A - Permanent shallow marine waters typically less than six metres at low tide; includes sea bays & straits.	No equivalent VWCS category, but within: <ul style="list-style-type: none"> • permanent saline – intertidal flats • permanent saline – island • permanent saline - shallow 	40 479	Present - Victorian Ministry for Conservation (1980)	Present – refer to DEM (Figure 2-2)	Dendritic channels in the south eastern sections of the site.
B - Marine subtidal aquatic beds; includes kelp beds, sea-grass beds, tropical marine meadows.		4967	Present – Roob <i>et al.</i> (1998) based on 1980-1981 aerial photography	Present – Roob <i>et al.</i> (1998), Hindell <i>et al.</i> (2007)	Present throughout site – see Section 3.3.1
		58			
D - Rocky marine shores; includes rocky offshore islands, sea cliffs.	No equivalent VWCS category		Present - Morgan (1986)	Present – Plummer <i>et al.</i> (2003) EVC mapping (2005) (Rocky Shore)	Small areas near Tin Mine and Freshwater Coves, and near Bennison Island (Morgan 1986).
E - Sand, shingle or pebble shores; includes sand bars, spits and sandy islets; includes dune systems and humic dune slacks.	No equivalent VWCS category, but within: Permanent saline – intertidal flats	See above for Wetland Type A and B	Present - Morgan (1986)	Present – Plummer <i>et al.</i> (2003) EVC mapping (2005) (Sandy Beach)	Present on sand barrier islands including Snake, Sunday, Shag Islands (Morgan 1986).
G - Intertidal mud, sand or salt flats.			Present - Morgan (1986)	Present – Plummer <i>et al.</i> (2003), see also Figure 2-3	Present throughout site – see Section 3.3.1
H - Intertidal marshes; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.	<ul style="list-style-type: none"> • semi-permanent saline – salt flats • semi-permanent saline – salt meadow • semi-permanent saline – salt pan 	211 406 49	Present - Morgan (1986)	Present – Plummer <i>et al.</i> (2003) EVC mapping (2005) (Coastal Saltmarsh)	Extensive areas along north-eastern shoreline between Manns Beach and McLoughlins Beach, including the northern shoreline of Saint Margaret Island
I - Intertidal forested wetlands; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.	Permanent saline - mangroves	2061		Present – Plummer <i>et al.</i> (2003) EVC mapping (2005) (Mangrove Shrubland)	
F - Estuarine waters; permanent water of estuaries and estuarine systems of deltas.	Permanent saline - shallow	58	Present - Morgan (1986)	Present – Plummer <i>et al.</i> (2003); EVC mapping (2005) (part of Estuarine	Agnes, Albert, Tara Rivers, and various estuarine creeks along length of western shoreline.

SITE DESCRIPTION

Wetland Type	Time of listing			Present day	Representative examples
	Interpreted Category	VWCS Area (hectares)	Other Sources		
				Wetland)	
K - Coastal freshwater lagoons; includes freshwater delta lagoons.	No equivalent VWCS category, but within deep freshwater marsh – open water	162	N/A	DSE Online Interactive Map EVC mapping (2005) (part of Water Body – Fresh)	Present - Bullock and Tree Bullock Waterholes, The Big Hole (Snake Island)
<p>Tp - Permanent freshwater marshes/pools; ponds (below eight hectares), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.</p> <p>Ts - Seasonal/intermittent freshwater marshes/pools on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.</p>	No specific VWCS category, but within shallow freshwater marsh, deep freshwater marsh	See K	N/A	EVC mapping (2005) (part of Water Body – Fresh, Wetland Formation, Wet Heath) EVC mapping (2005)	Present – Snake Island
					Present – Snake Island
W - Shrub-dominated wetlands; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.	Freshwater meadow and shallow freshwater marsh	None mapped	N/A	EVC mapping (2005) (part of Wet Heath)	Present - Snake Island
Xf - Freshwater, tree-dominated wetlands; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.	No specific VWCS category	N/A	N/A	EVC mapping (2005)(part of Damp Woodland EVCs)	Present - Snake Island
N - Seasonal/intermittent/irregular rivers/streams/creeks.	No specific VWCS category	None mapped	N/A	DSE Online Interactive Map EVC mapping (2005) (part of Water Body – Fresh)	Present - small, unnamed watercourses mapped by DSE on Snake and Sunday Islands.

Department of Sustainability and Environment

Corner Inlet Ramsar Site - Wetland Types

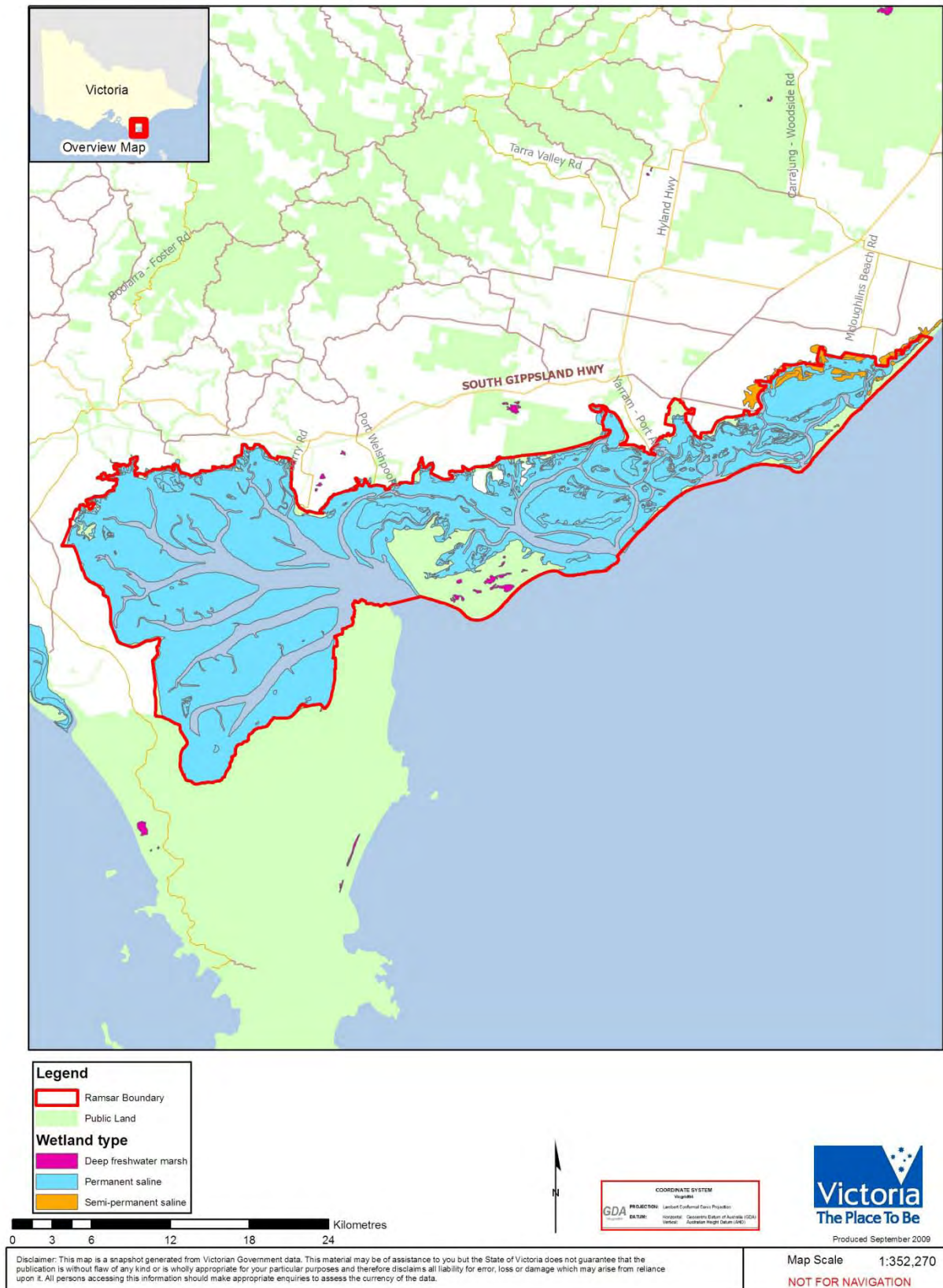


Figure 2-1 Victorian Wetland Classification System Wetland Types within the Corner Inlet Ramsar Site (Source: DSE unpublished)

Department of Sustainability and Environment

Corner Inlet Ramsar Site- 2005 Ecological Vegetation Classes

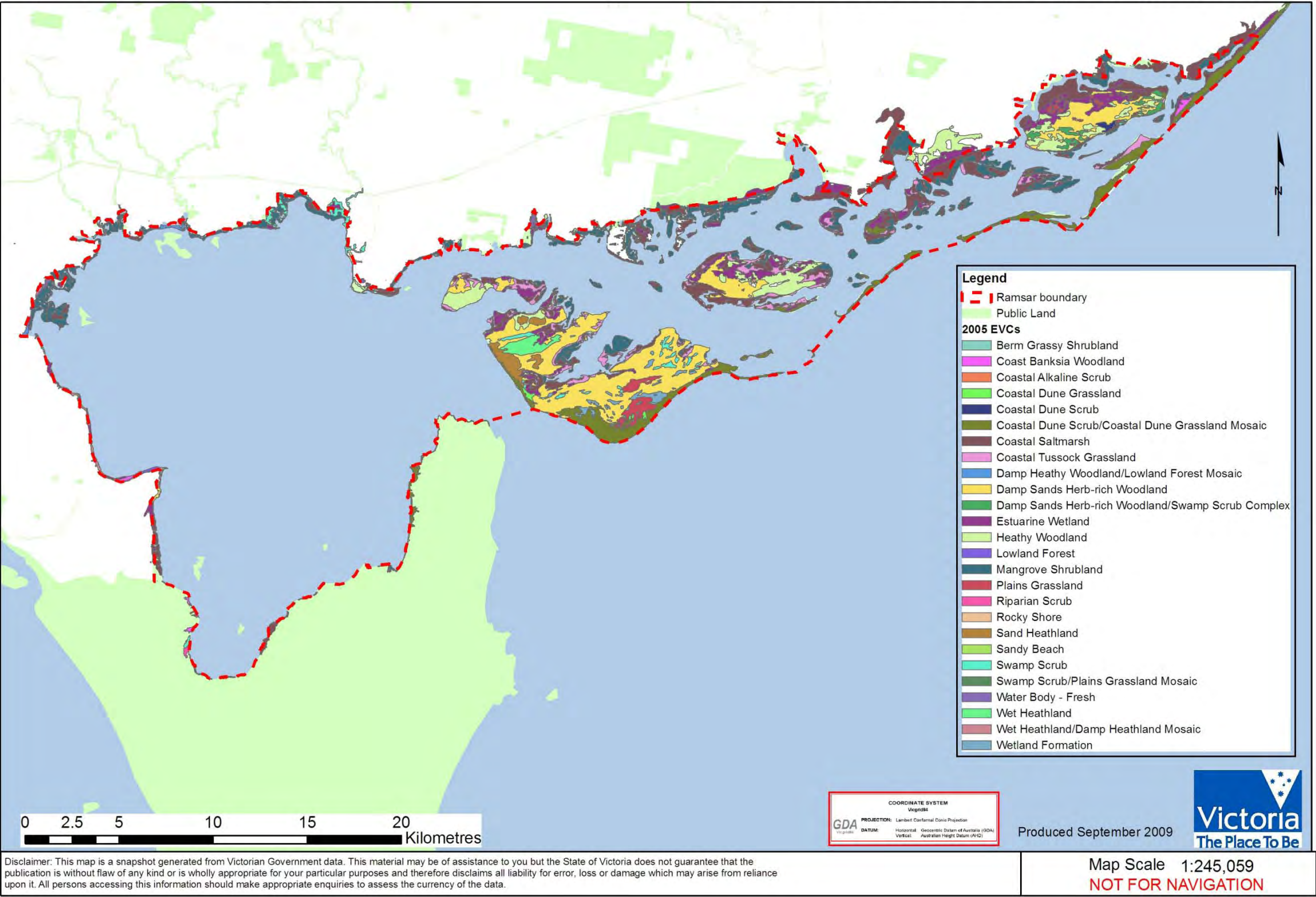


Figure 2-2 EVC (2005) Map for the Corner Inlet Ramsar Site (Source: DSE unpublished)

2.1.2.2 Marine/Coastal Wetland Types

Figure 2-3 is a digital elevation model (DEM) showing the bathymetry of Corner Inlet and surrounding waters. The DEM shows that approximately 540 square kilometres of the total 630 square kilometres area of the site is water or intertidal flats with the remainder comprising island and fringing wetlands.

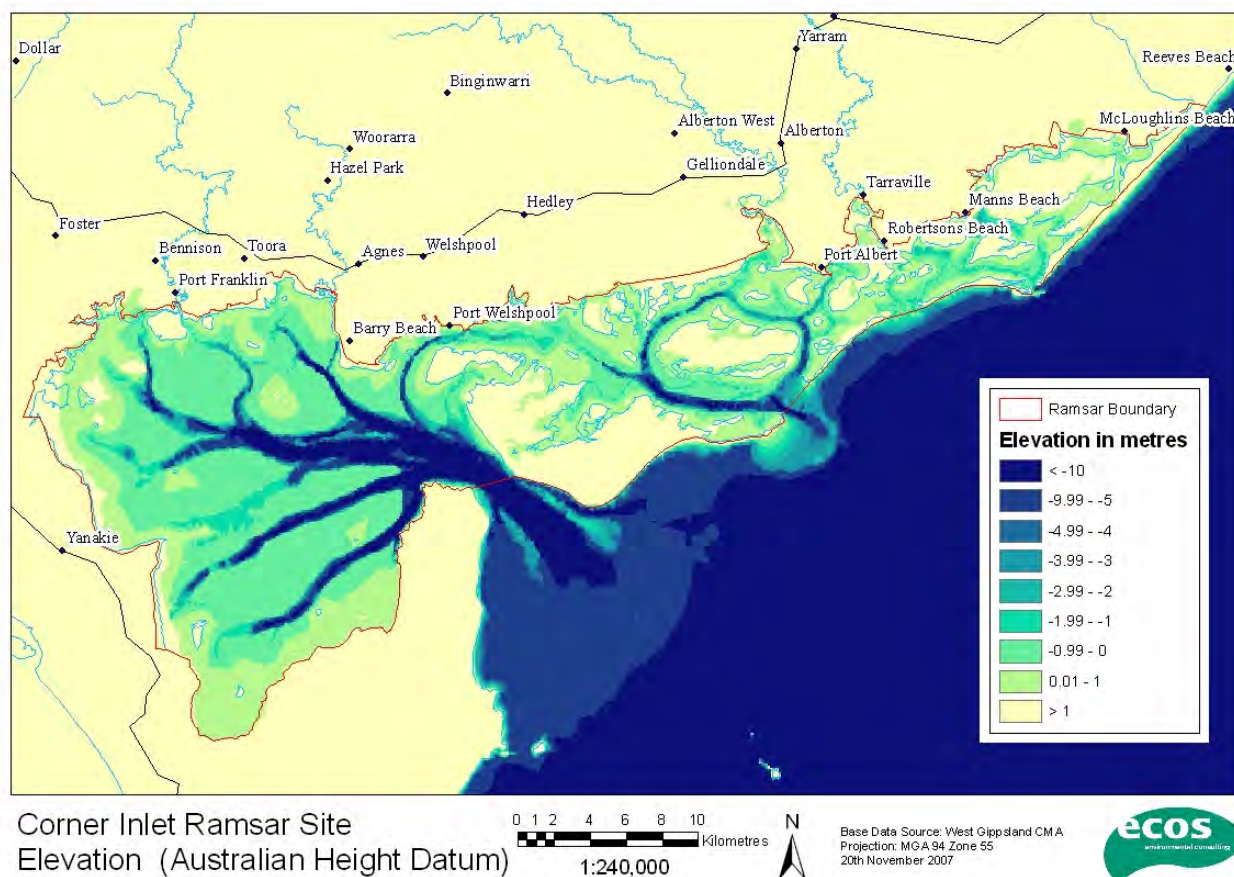


Figure 2-3 DEM Showing Bathymetry of Corner Inlet (Reproduced from Ecos unpublished)

The receiving waters of Corner Inlet are mostly a shallow intertidal environment comprising extensive mud and sandflats and seagrass beds (about 385 square kilometres of the inlet is shallower than 1.0 metre) (Ecos unpublished). The embayment is dissected by a network of deeper channels that drain and fill from the entrance to the east. The three main channels (Franklin, Middle and Bennisson) are three to 10 metres deep becoming shallower in the northern and western areas of the inlet. Channels near the centre and entrance of the inlet are deeper, reaching depths of about 40 metres, although in the Marine National Park the maximum depth is 20 metres (Plummer *et al.* 2003).

The following sections provide a discussion on the Ramsar wetland types found at the site.

Wetlands Identified in the Ministry for Conservation (1980) RIS

Type A: Permanent Shallow Marine Waters

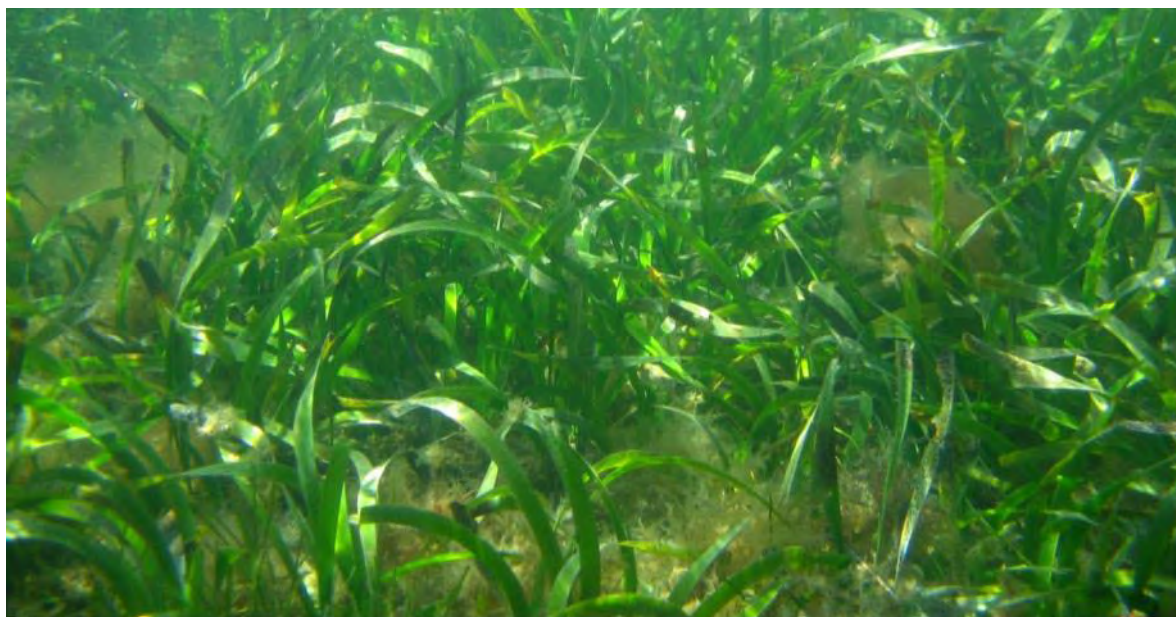
This wetland type incorporates marine waters that are less than six metres deep at low tide, including sea bays and straits. Large areas of shallow marine waters are located within the eastern half of the Corner Inlet Ramsar site.



Shallow permanent waters and sandy beach wetland types - Corner Inlet (Photo: Parks Victoria)

Type B: Marine Subtidal Aquatic Beds

This wetland type is represented within the Corner Inlet Ramsar site by seagrasses that form meadows in clear, low energy, shallow waters. Seagrass beds are present throughout the whole embayment, varying in species composition and abundance, and covering a total area of approximately 14 800 hectares (Roob *et al.* 1998), although abundance and extent can vary greatly over time (see Section 3.3.1). The site contains extensive beds of *Posidonia australis* (Frood 1986, Morgan 1986), with other species present including *Zostera muelleri* and *Halophila australis* (Roob *et al.* 1998) and *Heterzostera tasmanica* (O'Hara *et al.* 2002). The seagrass beds have a high primary productivity, and provide food and habitat for commercially and recreationally important fish and invertebrate species.



***Posidonia australis* meadow - Corner Inlet (Photo: Parks Victoria)**

Type G: Intertidal Mud, Sand or Salt Flats

This wetland type encompasses habitats comprised of alluvial deposits of sand and mud that accumulate on intertidal flats. The most extensive intertidal flats in Victoria are present within the Ramsar site, covering an area in excess of 38 700 hectares (NLWRA 2001) to 40 479 hectares based on VWCS (Table 2-2). Many invertebrate species inhabit these intertidal flats, and when exposed at low tides, these represent an important food resource for shorebirds.



Intertidal flats - Corner Inlet (Photo: Parks Victoria)

Type H: Intertidal Marshes

This wetland type is represented in the Ramsar site by saltpan vegetation on marine clay plains, as well as saline or brackish sedgeland. Saltmarsh typically occurs in the upper-intertidal zone as a band along the landward edge of the mangrove zone, covering an area of approximately 2613 hectares within the site (EVC mapping; see Figure 2-6). In particular, saltmarsh communities are notable along the northern mainland shore of Ramsar site, and on most of the islands including Franklin Island and Snake Island. Characteristic vegetation communities are samphire herblands dominated by *Sarcocornia quinqueflora* (beaded glasswort), with other species including sea rush (*Juncus kraussii*), shiny swamp-mat (*Selliera radicans*) and creeping brookweed (*Samolus repens*) (Davies *et al.* 2001).



Intertidal marshes - Corner Inlet (Photo: Parks Victoria)

Type I: Intertidal Forested Wetlands

This wetland type is represented within the Ramsar site by mangrove shrublands to low closed forest. Dense mangrove stands are found along the northern mainland shore of the Ramsar site, and scattered patches occur along the southern shore, the islands and within the estuarine environments. In total, mangroves occupy an area of approximately 2137 hectares within the site (2005 EVC mapping; see Figure 2-6). These communities are comprised of a single mangrove species, namely white mangrove (*Avicennia marina*), representing the most southerly distribution of this species on a global scale (Ball in Plummer *et al.* 2003). Mangroves are important roosting and sheltering sites for a variety of shorebirds, and provide nursery grounds for fish and a diversity of invertebrate fauna.



Mangroves and intertidal seagrass meadows at Toora - Corner Inlet (Photo: Parks Victoria)

Confirmed Additional Marine/Coastal Ramsar Wetland Types

Type D: Rocky Marine Shores

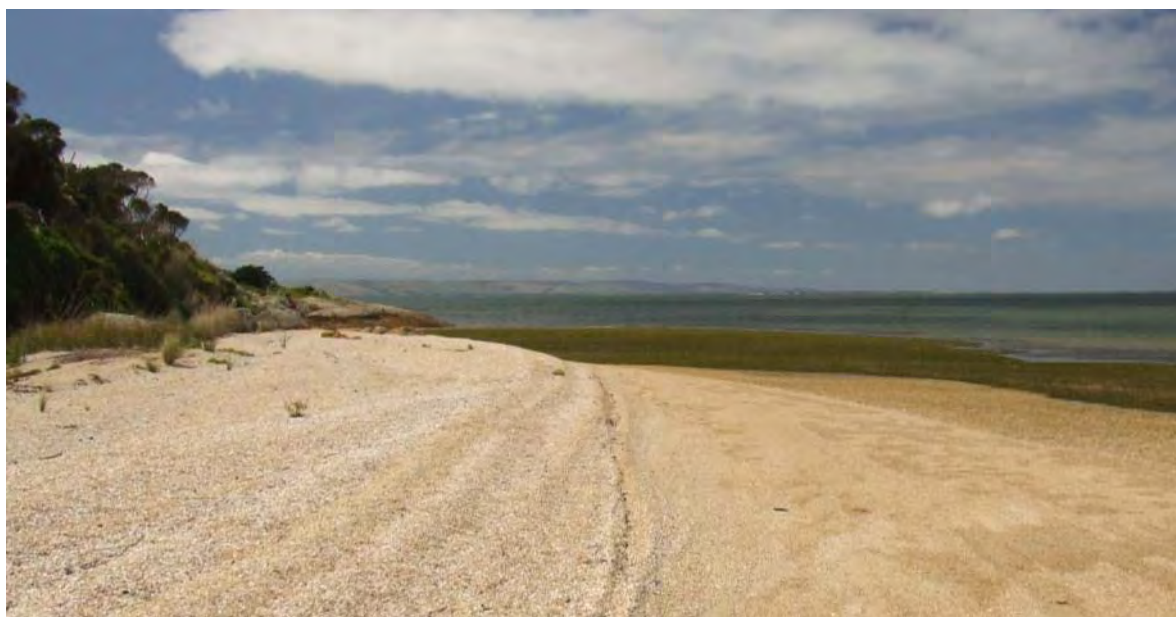
This wetland type is characterised by exposed rocky marine shores, including rocky offshore islands and sea cliffs. Plummer *et al.* (2003) recorded small sections of this habitat type near Tin Mine Cove and Freshwater Cove in the northern section of the Corner Inlet Marine National Park and near Bennison Island in the southern section of the Marine National Park, which are located within the site (Figure 1-2). EVC mapping by DSE (in 2005) shows that approximately 0.002 hectares of rocky shore are mapped within the site (Figure 2-6). Rocky shores provide habitats for a wide range of algae, marine invertebrates and fish species.



Subtidal reef - Corner Inlet (Photo: Parks Victoria)

Type E: Sand, Shingle or Pebble Shores

This wetland type includes sand, shingle or pebble shores, as well as sand bars, spits, sandy islets, dune systems and humid dune slacks. Sand barrier islands are fringed by sandy beach habitats, including Snake, Sunday and Shad islands (Figure 1-2 and 1-3), with a total of 29 hectares of sandy beach mapped within the site in 2005 EVC mapping by DSE (Figure 2-6). Additionally, there are numerous intertidal sand spits within the coastal sand barrier complex that represents the eastern boundary of the site.



Sandy beach wetland type - Corner Inlet (Photo: Parks Victoria)

Type F: Estuarine Waters

This wetland type includes permanent water of estuaries and estuarine systems of deltas. Determining the extent and distribution of estuarine waters is to a large extent dependent on the definition of an estuary. In broad terms, the definition of estuary could apply to all marine/coastal waters within the site, since it is an enclosed waterbody that represents a mixing zone between freshwater and marine waters. However, for the purposes of this study, estuarine waters are considered here to include the freshwater/marine interface area within creeks and rivers. Notable examples within the site include Agnes, Albert, Franklin and Tarra Rivers, Bruthen Creek and the smaller estuarine creeks along length of western shoreline.



Estuarine creek mouth - Corner Inlet (Photo: Parks Victoria)

Type K: Coastal Freshwater Lagoons

This wetland type consists of coastal freshwater lagoons. Based on DSE mapping, there appear to be several freshwater lagoons within the site. Representative examples of coastal freshwater lagoons include Big Hole, Tree Bullock and Bullock Waterholes on Snake Island, and unnamed waterholes on Saint Margaret Island (Figure 1-2).



Big Hole, a coastal freshwater lagoon on Snake Island - Corner Inlet (Photo: Parks Victoria)

2.1.2.3 Inland Wetland Types

Confirmed Additional Inland Ramsar Wetland Types

Type N: Seasonal Rivers/Streams/Creeks

This wetland type incorporates seasonal rivers, streams and creeks. This wetland type is represented within the Ramsar site by small, unnamed watercourses mapped by DSE on Snake and Sunday Islands.

Type Tp: Permanent Freshwater Marshes/Pools and Type Ts: Seasonal/Intermittent Freshwater Marshes/Pools on inorganic soils

These wetland types include marshes and swamps with emergent vegetation that is waterlogged for at least most of the growing season. Within the Ramsar site, this wetland type consists of herblands, sedgeland and rushlands that are associated with standing water ranging from permanent to ephemeral water bodies. Characteristic species include water ribbons (*Triglochin procerum*), yellow bladderwort (*Utricularia australis*), tall spike-sedge (*Eleocharis sphacelata*) and tall rush (*Juncus procerus*) (Davies *et al.* 2001). This wetland type is mapped in the southern area of Snake Island, and covers an area of 1405 hectares within the Ramsar site according to 2005 EVC mapping by DSE (noting that permanent and seasonal marshes cannot be differentiated in this mapping).



Freshwater marsh on Snake Island - Corner Inlet (Photo: Parks Victoria)

Type W: Shrub-dominated Wetlands

This wetland type includes shrub swamps and shrub-dominated freshwater marshes. It is represented within the Corner Inlet Ramsar site by wet heathland that is mapped as covering approximately 220 hectares within the Ramsar site (EVC mapping by DSE based on EVC 8 and 686). This wetland type occurs on infertile sands that are subject to prolonged water logging, and is present on Snake Island. Shrub species that may be present include prickly tea-tree (*Leptospermum*

continentale), common heath (*Epacris impressa*), coral heath (*Epacris microphylla*) and smooth parrot-pea (*Dillwynia glaberrima*) (Davies *et al.* 2001).

Type Xf: Freshwater Tree-dominated Wetlands

This wetland type includes freshwater swamp forests, seasonally flooded forests and wooded swamps. It is represented within the Ramsar site by swamp scrubs on poorly drained soils that are inundated during the wetter months. This vegetation community is typically dominated by swamp paperbark (*Melaleuca ericifolia*). The understorey varies in composition depending on the duration of water logging and the density of the canopy, and may include mosses, grasses (for example, common reed *Phragmites australis*), sedges (for example, tall sedge *Carex appressa* and common spike-sedge *Eleocharis acuta*) and/or herbs (for example, slender knotweed *Persicaria decipiens*) (Davies *et al.* 2001). Within the Ramsar site, large areas of Snake Island and smaller patches along the western and northern mainland shores contain freshwater tree-dominated wetlands.

Potential Additional Ramsar Wetland Types Requiring Ground-truthing

Type U: Non-forested Peatlands and Type Xp: Forested Peatlands

Although peat soils have been recorded within the Ramsar site (for example, Davies *et al.* 2001; CSIRO 2005), it is uncertain whether peat swamp is present. If present, it is likely that areas mapped as wetland types Tp/Ts, W and Xf also contain this wetland type.

As outlined in the Ramsar Guidelines for Global Action on Peatlands (GAP), peatlands are increasingly being recognised as an important wetland resource at the global level through their role in contributing to global biodiversity, as an important carbon sink and through the retention of paleo-environmental information about previous landscapes and climate states.

Artificial Wetland Types

There are also likely to be several man-made wetland types present within the Ramsar site, although there are no data to determine their presence and extent. Man-made wetland types potentially within the site include:

- Type 2: Ponds, including farm ponds, stock ponds and small tanks
- Type 9: Canals and drainage channels.

2.1.3 Uses and Tenure

2.1.3.1 Adjacent Land Use

Agriculture and Forestry

The catchments that drain into the Corner Inlet Ramsar site (the catchment) have a combined area of approximately 2100 square kilometres (CSIRO 2005). The catchment of Corner Inlet is predominantly privately owned land. Since European settlement in the mid to late 1800's, most of the catchment has been cleared of forest vegetation, and is now mainly used for agricultural purposes, most notably for dairying and grazing (Figure 2-4). Plantation forestry activities have included native (for example, Tasmanian blue gum *Eucalyptus globulus*) and exotic (for example, radiata pine *Pinus radiata*) species (DSE 2003).

Urban

The wider region includes two municipalities: Wellington and South Gippsland Shires. For the period 1991 to 2004, Australian Bureau of Statistics (ABS) census figures showed that the population of South Gippsland Shire increased by approximately four per cent, or 0.3 per cent per annum. By 2031 it is estimated that the population of the Shire will increase to 31 934, which represents a growth rate of approximately 1.4 per cent per annum. There is limited urban development within the catchments of the site, with most of the population dispersed between several regional centres in the vicinity of the main highways (for example, Yarram, Woodside and Foster). The main coastal settlements adjacent to the site include Manns Beach, Roberstons Beach, and McCoughlins Beach.

Conservation Estate

Land to the south of the site is predominantly contained within Wilsons Promontory National Park. Areas of conservation reserve also occur throughout the wider catchment area (Figure 2-5).

2.1.3.2 Tenure

The site has complex tenure arrangement and multiple site managers (DNRE 2002). Ecos (unpublished) provides a detailed account of tenure, which is summarised as follows:

- Most public lands and waters within the site are managed by Parks Victoria (Figure 2-5). In this regard:
 - Most public land and waters within the site (89 per cent of the total site area) are contained within Corner Inlet Marine and Coastal Park (27 848 hectares), Nooramunga Marine and Coastal Park (30 101 hectares) and Corner Inlet Marine National Park (1641 hectares). These areas are managed by Parks Victoria under the provisions of the *National Parks Act* and *Parks Regulations*.
 - Land areas above high water mark on Doughboy Island, Bennison Island, Granite Island, Long Island and Corner Island (Figure 1-2), together with the intertidal area in the southern section of Corner Inlet, form part of Wilsons Promontory National Park. The Park is managed by Parks Victoria under the provisions of the *National Parks Act* and *Parks Regulations*.

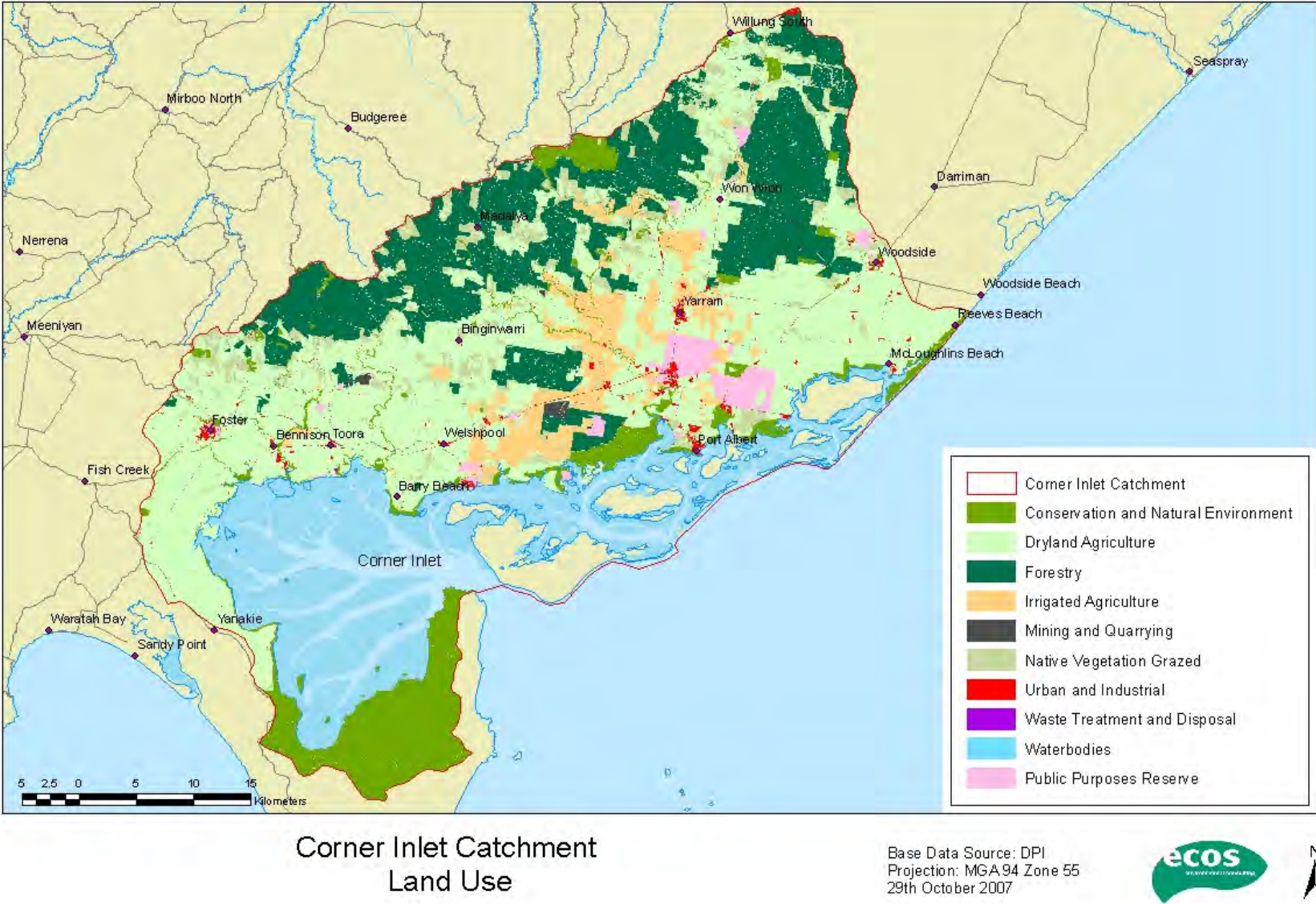


Figure 2-4 Corner Inlet Catchment and Land Use (Reproduced from Ecos unpublished)

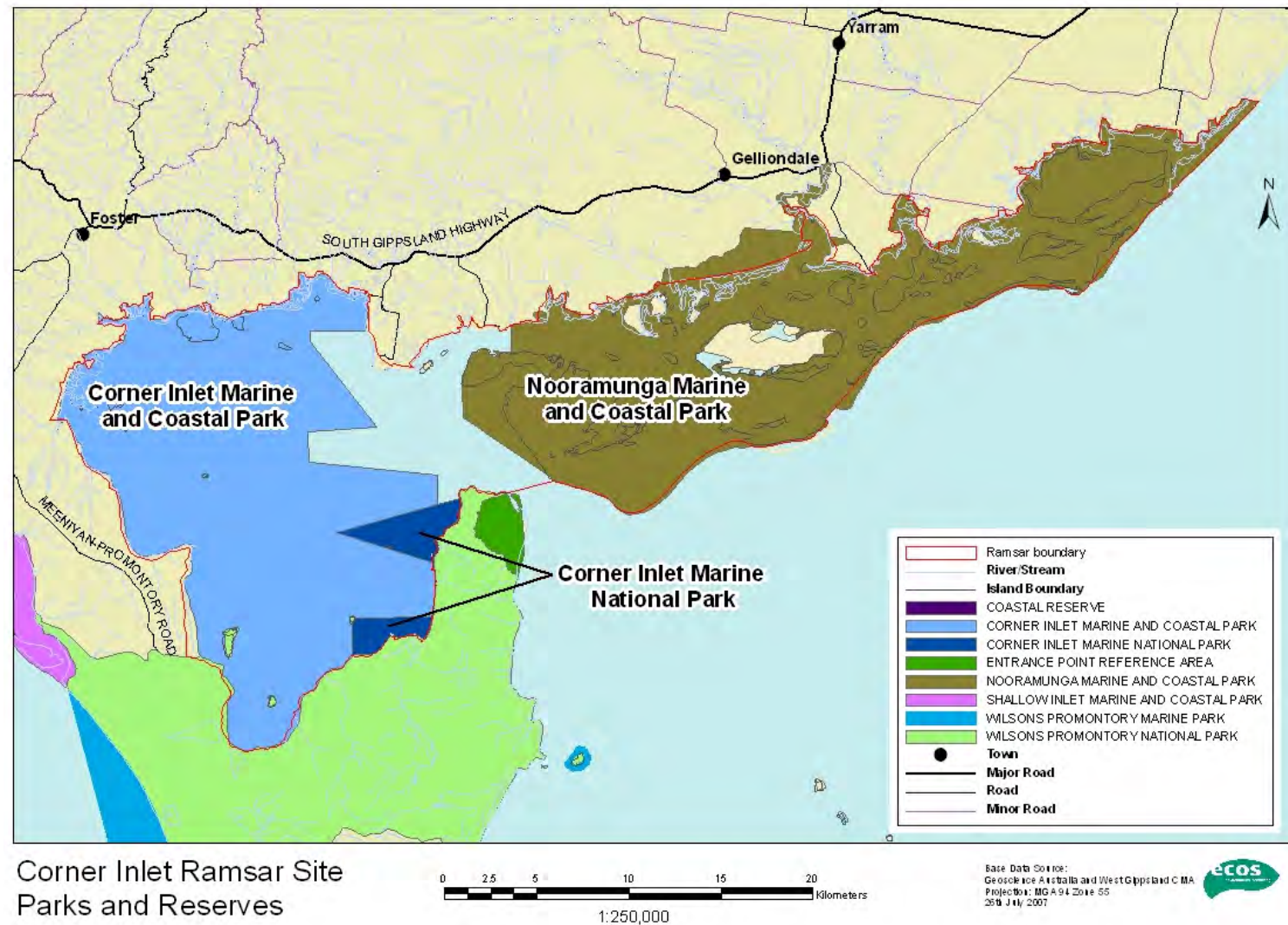


Figure 2-5 Parks, Reserves and Other Land Tenure within and Surrounding the Corner Inlet Ramsar Site (Reproduced from Ecos unpublished)

- Land and waters within Port areas (Port Welshpool and Port Albert) are managed by Gippsland Ports under the *Crown Reserves Act*
- Sunday Island, Dog Island, Little Dog Island, Hunter Island and Bullock Island are privately owned and managed
- The remaining areas of the Ramsar site are either unreserved Crown Land or are included in various public purposes or coastal reserves.

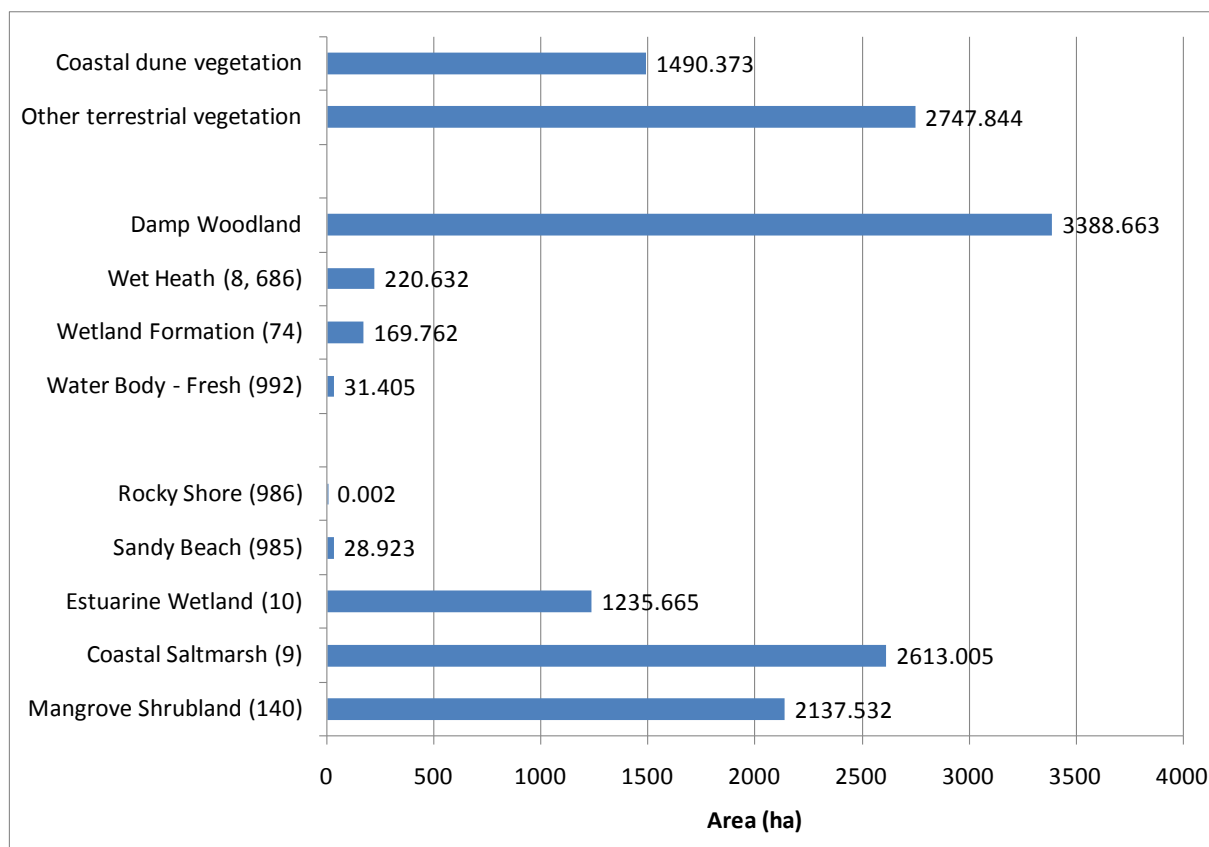
2.1.4 Natural Values

The Ramsar site has notable natural values afforded by the diversity of marine, estuarine and freshwater wetland habitats, most of which are presented in a near-natural condition. Marine flora communities within the Ramsar site are especially noteworthy due to their unique status in the bioregion. In particular, the Ramsar site has the largest *Posidonia* seagrass beds in Victoria (Frood 1986, Morgan 1986) and elsewhere in the Southeast Coast IMCRA Transition bioregion (West et al. 1985).

The site has high biodiversity values, which are summarised by DNRE (2002) as follows:

- Approximately 390 species of indigenous flora and approximately 160 species of indigenous terrestrial fauna have been recorded at the site
- To date, 24, 26 and 27 bird species listed under JAMBA, CAMBA and ROKAMBA, respectively, have been recorded at the site
- A total of 25 bird species listed under the Bonn convention have been recorded at the site
- Over 390 species of marine invertebrates have been recorded in the site. Three invertebrate species appear to be restricted to Corner Inlet, and have been recommended for listing as vulnerable species under the Victorian *Flora and Fauna Guarantee Act 1988*
- A wide variety of marine mammals occur in the site including bottlenose dolphins and Australian fur seals, as well as occasional records of common dolphins, New Zealand fur seals, leopard seals and southern right whale.

Vegetation mapping by DSE for the year 2005 identifies 28 EVCs within the site. Figure 2-6 summarises the total mapped area of individual wetland-associated EVCs, as well as total area of terrestrial vegetation EVCs (pooled). Notwithstanding the limitations of this broad-scale mapping, it is apparent that the largest vegetation community type by area is damp sands herb-rich woodland (EVC 3; 34 per cent of mapped vegetation), followed by coastal saltmarsh (EVC 9; 19 per cent of mapped vegetation) and mangrove shrublands (EVC 140; 15 per cent of mapped vegetation). This mapping does not include seagrass vegetation or open marine waters.



Note: Vertical axis indicates EVC number and name. Some EVCs are pooled as follows: Coastal dune vegetation (EVC 1, 2, 160, 163), Damp Woodland (EVC 3, 878, 1106), Other Terrestrial (EVC 6, 48, 53, 83, 132, 163, 311, 687, 16)

Figure 2-6 Vegetation Communities within the Site (Source: EVC mapping by DSE)

In terms of noteworthy terrestrial flora, two nationally vulnerable orchid species have been recorded within the Ramsar site (*Caladenia tessellata* and *Pterostylis cucullata*), but these species have not been considered in the context of this ECD as they are not wetland-dependent species. It is possible that other flora species of conservation significance that are wetland-dependent exist within the site, but have not been recorded due to lack of survey effort.

In terms of functional values, the extensive tidal flats, together with fringing wetland habitats, provide important roost sites, feeding and breeding areas for shorebirds. The 'unvegetated' tidal flats are in fact important habitats for microphytobenthos, which are unicellular algae that are key drivers of ecosystem processes in the Inlet. These tidal flats, together with deeper waters areas, are also habitats for a wide range of benthic invertebrate and fish species.

The marine, estuarine and freshwater habitats of the site support a wide range of fish species at different stages of their life-cycle and for different functions (that is, larvae, post-larvae, spawning, feeding, shelter, migratory routes etc.).

Corner Inlet also provides a number of important functions that contribute to the maintenance of the wetland and surrounding ecosystems, including (DNRE 2002):

- Saltmarsh and mangrove communities filter pollutants, stabilise sediments, trap and process nutrients and protect the shoreline from erosion

- The site provides food, nesting and nursery areas for many animals including a variety of reptiles, amphibians, mammals, fish and birds, including threatened species
- The intertidal area depends on surrounding beaches and catchment inputs for the nutrients that sustain invertebrate populations.

In addition it is noted that terrestrial freshwater runoff can supply a significant proportion of organic matter, which can settle or be filtered into the intertidal sediments. Another labile source of organic material is microalgae growing on or in the sediments of intertidal flats. The breakdown of this organic material by bacteria can lead to a significant release of nutrients.

West Gippsland CMA (2007) examined the comparative environmental values of 'significant wetlands' in the west Gippsland region. Environmental values were assessed on the basis of a range of metrics describing wetland significance, wetland rarity, significant flora, significant fauna, vegetation intactness, hydrology and habitat values. Corner Inlet was ranked fourth of 23 wetlands.

2.1.5 Socio-Economic and Cultural Values

The following provides a summary of the uses and cultural/socio-economic values of the site.

Ports and Harbours

Corner Inlet encompasses four ports: Port Albert, Port Franklin, Port Welshpool, and Barry's Beach. These ports service the commercial fishing industry, minor coastal trade, offshore oil and gas production and boating visitors. Barry's Beach marine terminal is the main launch facility to the Bass Strait oil field platforms (DSE 2003), whereas the other three ports predominantly service the commercial fishing industry.

Fishing

Corner Inlet is one of only three estuaries or bays where commercial fishing is allowed in Victoria (DPI 2008). In economic terms, the commercial bay and inlet fishery has an estimated wholesale value of approximately 5 to 8 million dollars annually. The commercial fishery also produces economic flow-on effects to the wider community. Victoria DPI (2008) suggests that these fisheries supply high priced product for niche markets. The Inlet is also a popular recreational fishing area (Gunthorpe and Hammer 2000). Most recreational fishing is boat based due to limited shoreline access (DCNR 1995). Refer to Sections 2.2.2 and 3.7.2 for details.

Recreation and Tourism

DNRE (2002) states that "Corner Inlet is a popular visitor destination attracting an estimated 150 000 visitor days per year". Tourism and recreational values of the Ramsar site and surrounds predominantly relate to nature-based activities. The Ramsar site includes important terrestrial and aquatic environments for tourism and recreational activities including recreational fishing, boating/yachting, sightseeing, horse riding, scuba diving, bird watching, and bushwalking.

The proximity of the Ramsar site to Victoria's capital city, Melbourne, as well as the LaTrobe Valley, highlights the importance of the site for regional residents and visitors, both for tourism and recreational purposes, and the need to ensure conservation and wise use of the area (that is,

management of impacts from tourism and recreation). DNRE (1996) suggest that the tourist values of the site could increase with increased promotion of tourism opportunities.

Cultural Heritage

The seascape has high cultural significance to indigenous groups (Parks Victoria 2005). DNRE (2002) states that “the Brataulong Clan of the Gunai/Kurnai Tribe has strong cultural traditions and practices associated with the area”. Numerous sites have been recorded in the area including scarred trees, burial sites, artefact scatters, camps and shell middens. Several indigenous groups are asserting traditional ownership over the site (Parks Victoria 2005). Groups identifying the area as their Traditional Country include the Boon Wurrung, Bunurong and Gunai/Kurnai.

Casanelia (1999) and DNRE (2002) identify shipwrecks as key cultural heritage features within and adjacent to the site. DNRE (2002) estimates that 31 shipwrecks occur in the site, 23 of which occur around Port Albert. These features illustrate aspects of European settlement, including the history of trade, ship building and propulsion. Historic coastal port townships of Port Albert and Port Welshpool are also key European cultural heritage features of the area DNRE (2002).

Research and Education

The site does not contain any scientific research stations. However, the Inlet is used as a site for scientific research programs by several institutions including:

- Arthur Rylah Institute for Environmental Research (ARI), the research arm of DSE, based in Heidelberg (Melbourne) Victoria. Arthur Rylah is a centre for applied ecological research, with an emphasis on flora, fauna and biodiversity issues. Research themes include wetland health and ecology, threatened species, and mapping and measuring biodiversity (including wetland condition). ARI's main focus is on providing strategic research and management advice to answer key questions affecting ecologically sustainable land or water management and resource use policies
- Marine and Freshwater Resources Institute - Victoria Department of Primary Industries, based in Queenscliff, who have conducted seagrass studies in Corner Inlet
- CSIRO Marine and Atmospheric Research, based in Aspendale (Melbourne), Victoria whose research in the area has covered areas such as marine pests, and who have also conducted a shark tagging study that has recorded White Sharks (*Carcharodon carcharias*) in waters near Corner Inlet.

Other universities and colleges use Corner Inlet for research and education, including University of Melbourne and Victoria University.

2.2 Ramsar Nomination Criteria

2.2.1 Original Criteria under which the Site was Listed

Each site nominated under the Ramsar Convention must address some or all of the Ramsar nomination criteria established by the Convention. At the time of listing in 1982, the Corner Inlet Ramsar site was identified as meeting some of these criteria.

The 'original' nomination documentation indicated that the site met criteria 1(a), 1(b), 1(c), 2(b) and 3 of the 'recommended criteria to be used in identifying wetlands of international importance' (Victorian Ministry For Conservation 1980). The criteria at this time related to those adopted as part of the First Meeting of the Conference of Contracting Parties for the Ramsar Convention assembled in Cagliari, Sardinia (CoP 1 Criteria).

The relevant 'Cagliari' criteria met by the site were as follows:

- 1. *A wetland should be considered internationally important if it:*
 - (a) *regularly supports either 10 000 ducks, geese and swans; or 10 000 coots; or 20 000 waders.* This criterion is broadly analogous of the present day criterion 5 (see Section 2.2.2).
 - (b) *regularly supports one per cent of the individuals in a population of one species or subspecies of waterfowl.* This criterion is broadly analogous of the present day criterion 6 (see Section 2.2.2).
 - (c) *regularly supports one per cent of the breeding pairs in a population of one species or subspecies of waterfowl.* This criterion does not have a direct analogue to present-day criterion.
- 2. *A wetland should be considered internationally important if it:*
 - (b) *is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna.* This criterion is broadly analogous of the present day criterion 3 (see Section 2.2.2).
- 3. *A wetland should be considered internationally important if it is a particularly good example of a specific type of wetland characteristic of its region.* This criterion is broadly analogous of the present day criterion 1 (see Section 2.2.2).

The documentation supporting the original listing (Victorian Ministry for Conservation 1980) outlines the following justification for criterion 1 (noting that no justification was provided to support criteria 2 (b) and 3):

Corner Inlet regularly supports an estimated 29 0000 waders (migratory and non-migratory) which represent 21.5 per cent of the total known Victorian wader population and include(s) the majority of Victoria's population of less abundant wader species. For the species grey plover, bar-tailed godwit, red knot and great knot, the Corner Inlet populations represent the largest in southern Australia (greater than one per cent of the "flyway or biogeographical region", according to the Royal Australasian Ornithologists Union (RAOU)), while for the eastern curlew, Corner Inlet supports the largest populations yet discovered in Australia. It is estimated that 50 per cent of the overwintering migratory waders in Victoria occur in Corner Inlet.

The southern portion of Corner Inlet periodically supports up to approximately 2000 chestnut teal, estimated by the RAOU to be between 12 and 18 per cent of the Victorian population. Corner Inlet also supports breeding colonies of the fairy tern, crested tern and short-tailed shearwaters.

Since the time of listing, the Ramsar nomination criteria under the Convention have been modified (Table 2-3). As shown in Table 2-3, the 1999 Corner Inlet RIS (Casanelia 1999) indicated that the site met the following criteria relevant at that time (that is, based on the Ramsar Convention Criteria adopted at the 1996 Conference of Parties – CoP 6 criteria):

- criteria 1a, 1b and 1c, which are analogous to present day criterion 1
- criterion 2b, which is the equivalent of present day criterion 3
- criterion 2c, which is the equivalent of present day criterion 4
- criterion 3a, which is the equivalent of present day criterion 5
- criteria 3b and 3c, which are the equivalent of present day criterion 6.

2.2.2 Assessment Based on Current Information and Ramsar Criteria

Further changes were subsequently made to the Ramsar criteria since the 1999 RIS prepared by Casanelia (1999). As such, there is a need to re-assess the status of the site against the 'new' criteria for the site as part of the current study. The nomination criteria met by the site as outlined in the earlier RISs (Victorian Ministry for Conservation 1980, Casanelia 1999) have been reconsidered in this ECD, with specific reference to more up to date requirements outlined in "Handbook 14 Designating Ramsar Sites" (Ramsar Convention Secretariat 2007) and the National ECD Framework (DEWHA 2008), as well as consideration of more up to date data.

Based on the present study, the site is considered to meet six of the Ramsar nomination criteria (Table 2-3). In summary:

- Criteria 1, 4, 5 and 6 are considered to be met by the site, consistent with the 1980 and 1999 RISs (using analogous criteria)
- Criterion 2 is considered to be met by the site, which is not consistent with the 1980 and 1999 RISs
- Criterion 8 is considered to be met by the site, which is not consistent with Casanelia (1999) (noting that this criterion did not have an equivalent analogue in the 1980 RIS)
- Criterion 3 is not considered to be met by the site, which is not consistent with the 1980 and 1999 RISs (using analogous criteria).

The nomination criteria and accompanying statements of justification are discussed below.

Table 2-3 Comparison of Current and Pre-1999 Ramsar Nomination Criteria

Notes: no shading indicates nomination criterion met by the Ramsar site, grey shaded indicates criterion not met, green shading indicates that there was no equivalent criterion

Present study using existing (COP 9) criteria	Casanelia (1999) RIS using COP 7 criteria	Victorian Ministry for Conservation (1980) RIS using COP 1 criteria
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.	<p>1(a) it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region</p> <p>1(b) it is a particularly good representative example of a natural or near-natural wetland, common to more than one biogeographical region</p> <p>1(c) it is a particularly good representative example of a wetland which plays a substantial hydrological, biological or ecological role in the natural functioning of a major river basin or coastal system, especially where it is located in a trans-border position</p> <p>1(d) it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region.</p>	3. it is a particularly good example of a specific type of wetland characteristic of its region.
Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.	2(a) it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species.	2(a) it supports an appreciable number of a rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species.
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	<p>2(b) it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna</p> <p>2(d) it is of special value for one or more endemic plant or animal species or communities</p>	<p>2(b) it is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna.</p> <p>2(d) it is of special value for one or more endemic plant or animal species or communities</p>
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.	2(c) it is of special value as the habitat of plants or animals at a critical stage of their biological cycle.	2(c) it is of special value as the habitat of plants or animals at a critical stage of their biological cycles.
Criterion 5: A wetland should be considered internationally important if it regularly supports 20 000 or more waterbirds.	3(a) it regularly supports 20 000 waterfowl.	1(a) it regularly supports either 10 000 ducks, geese and swans; or 10 000 coots; or 20 000 waders.
Criterion 6: A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird.	3(c) where data on populations are available, it regularly supports one per cent of the individuals in a population of one species or subspecies of waterfowl.	1(b) it regularly supports one per cent of the individuals in a population of one species or subspecies of waterfowl.

SITE DESCRIPTION

Present study using existing (COP 9) criteria	Casanelia (1999) RIS using COP 7 criteria	Victorian Ministry for Conservation (1980) RIS using COP 1 criteria
	3(b) it regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity.	1(c) it regularly supports one per cent of the breeding pairs in a population of one species or subspecies of waterfowl.
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.	4(a) 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.	No equivalent criterion
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.	4(b) 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.	No equivalent criterion
Criterion 9: A wetland should be considered internationally important if it regularly supports 1 per cent of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.	No equivalent criterion	No equivalent criterion

Criterion 1 - Met

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.

Criterion 1 considers habitat types and their representativeness within a given biogeographic region (bioregion). Corner Inlet occurs within the following biogeographic regions:

- Marine (IMCRA v4.0) – South-east IMCRA Transition Bioregion. This bioregion extends just west of Corner Inlet to near Nowra in southern NSW
- Freshwater/Terrestrial (Basins) – South-east Coast Drainage Division. This drainage division extends from around the Queensland-NSW border to near the Murray River mouth in South Australia.

Corner Inlet is a substantially unmodified site that is considered to represent an example of a near-natural wetland. According to the Ramsar definition, near natural wetlands are those “which continue to function in what is considered an almost natural way”. The definition includes clarification that the wetland is not required to be in pristine condition, only that it retains values of international importance. Activities occurring within Corner Inlet and the surrounding catchment (port activity, catchment run off, wastewater discharge and tourism) have potential to impact the condition of the inlet and do affect isolated areas of the site. However, these activities are small in scale, scope and area compared to the size of the inlet and do not prevent the inlet as a whole from continuing to function in an almost natural way. The 2001 National Land & Water Resources Audit (NLWRA 2001) classifies Corner Inlet as being in a “Largely Unmodified” condition (refer Appendix B).

The site has a complex range of estuarine habitats that are representative of those in the marine bioregion. Corner Inlet is considered a very good example of a wetland enclosed by barrier islands in the bioregion, and represents the second largest back barrier system in the IMCRA bioregion (NLWRA 2001). Corner Inlet also contains the most extensive intertidal flats and tidal sand banks in the bioregion (NLWRA 2001; refer Appendix B).

The sand barrier islands and tidal channel complex plays an important role in the natural functioning of this major coastal system. In particular, the sand islands protect the mainland coast from oceanic swells, which is a key determinant of the distribution and extent of wetland habitats within the site.

The site supports extensive *Posidonia* beds, which are among the largest in the IMCRA bioregion (West *et al.* 1985; Morgan 1986).

Based on the above, the site meets this criterion.

Criterion 2 - Met

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

The original nomination documentation and Casanella (1999) do not identify that the Corner Inlet Ramsar site meets this criterion. However, the current assessment proposes that the Ramsar site meets this criterion.

The Corner Inlet Management Plan notes that six nationally (EPBC Act) and/or globally (IUCN) endangered and vulnerable species¹ have previously been recorded within the Ramsar site: southern right whale (*Eubalaena australis* - EPBC endangered), leathery turtle (*Dermochelys coriacea* - EPBC vulnerable), swift parrot (*Lathamus discolor* - EPBC vulnerable) and orange-bellied parrot (*Neophema chrysogaster* - EPBC endangered)². Plummer *et al.* (2003) notes that shy albatross (*Thalassarche cauta cauta* - EPBC vulnerable) has also been recorded at the site. A search of the EPBC protected matters online database, which is based on species geographic distribution mapping for listed species, identifies that several other threatened species could potentially also occur within the site (primarily marine pelagic seabirds and non-wetland dependent species).

The ECD Framework (DEWHA 2008) indicates that 'wetland' flora and fauna species should be considered. This has been interpreted here as 'wetland-dependent' species, and therefore does not include terrestrial species that are not reliant on aquatic/wetland habitats (see Appendix A).

Species known to occur within the site, that are internationally or nationally threatened and considered as wetland dependent species are as follows:

- orange-bellied parrot (*Neophema chrysogaster*). This species is listed as critically endangered under the EPBC Act and IUCN Red List (IUCN 2010). The current total wild population of orange-bellied parrots is unlikely to exceed 150 individuals (OBPRT 2006). Current data indicates that a significant proportion of the known orange-bellied parrot population congregates at three sites in Victoria (around Port Phillip Bay and the Bellarine Peninsula) (Birds Australia 2009b). In the Gippsland area, there have been rare records at Jack Smith Lake, fringes of Corner Inlet and several islands within Corner Inlet, Andersons Inlet, and from the Powlett River mouth (DEWHA 2009b; Birds Australia 2009b)
- growling grass frog (*Litoria raniformis*). This species is listed as vulnerable under the EPBC Act and endangered under the IUCN Red List (2010). The most recent record with the DSE database is 1995, with earlier records in 1977 and 1982 (DSE 2009)
- fairy tern (*Sterna nereis nereis*). This species is listed as vulnerable under the IUCN Red List (IUCN 2010). Nesting, feeding and roosting areas occur within the site, with key breeding areas including Clonmel, Boxbank and Dream Islands (refer Figure 1-2 and 1-3), and barrier islands in the Nooramunga area (Minton in Bell 1998; Ecos unpublished). The Birds Australia Atlas contains records of this species in 1977, 1979, 1980, 1981, 2000, 2001, 2003 and 2007
- Australian grayling (*Prototroctes maraena*). This species is listed as vulnerable under the EPBC Act and near threatened on the 2010 IUCN Red List (IUCN 2010). This species has been

¹ Note that numerous other flora and fauna are considered as threatened under state legislation. Consistent with Ramsar listing requirements, unless these species are also considered internationally or nationally threatened, they can not be considered under this criterion.

² Bog gum *Eucalyptus kitsoniana* occurs in the site, but is listed as Rare under the EPBC Act 1999, and therefore does not meet this criterion. Little tern *Sterna albifrons* (EPBC – Migratory and Marine) and hooded plover *Thinornis rubricollis* (EPBC – Marine) are not considered as threatened under the Act.

recorded in the freshwater streams that feed directly into the site (that is, Franklin, Agnes, Albert and Tarra Rivers – see Backhouse *et al.* 2008), and is almost certain to be present in the site (see Section 3.7 for detailed discussion).

Based on the above, the site meets this criterion.

Criterion 3 – Not Met

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.

The key elements underpinning this criterion are outlined in Section 70 of the *Ramsar Handbook for Wise Use of Wetlands 14* (Ramsar Convention Secretariat 2007), namely that sites meeting this criterion:

1. are “hotspots” of biological diversity and are evidently species-rich even though the number of species present may not be accurately known and/or
2. are centres of endemism or otherwise contain significant numbers of endemic species and/or
3. contain the range of biological diversity (including habitat types) occurring in a region and/or
4. contain a significant proportion of species adapted to special environmental conditions (such as temporary wetlands in semi-arid or arid areas) and/or
5. support particular elements of biological diversity that are rare or particularly characteristic of the biogeographic region.

Corner Inlet supports approximately 171 fish species, at least 24 species of migratory shorebirds, and more than 390 native flora species (DSE 2003; see Section 2.1.4). There is no evidence to suggest that the site represents a ‘hot-spot’ of biological diversity within the South-east IMCRA Transition bioregion, and unlike southern Tasmania, for example, the site is not located in a centre of local endemism. While the site does support high biodiversity values at more local scales (for example, within Victorian waters) and a wide diversity of wetland types (see Section 2.1.2), there is presently insufficient information to determine whether the site supports the range species or habitats occurring in the bioregion. The site does not support a large proportion of species adapted to special environmental conditions.

Casanelia (1999) suggests that this criterion was met on the basis that the site contains the most southerly occurrence of white mangrove (*Avicennia marina*) in the world. However, in the context of other areas in the South-east IMCRA Transition bioregion, the presence of this mangrove species is not considered unusual. This element is not considered to represent any of the key biodiversity elements outlined for criterion 3 in Ramsar Convention Secretariat (2007), and is therefore not considered to represent justification for inclusion of the site for this criterion.

Based on the above, the site does not support this criterion.

Criterion 4 – Met

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.

Based on *Ramsar Handbook for Wise Use of Wetlands 14* (Ramsar Convention Secretariat 2007), there are two components that need to be considered:

1. Section 74. Whether the site has high proportions of the population of mobile or migratory species gathered in small areas at particular stages of their life-cycle
2. Section 75. For non-migratory species, whether the site supports habitats for species that are unable to evade unfavourable climatic or other conditions (that is, the site contains critical refugia areas).

The Ramsar site meets the requirements of Section 74 in terms of its function as a habitat for migratory shorebirds at a critical life-stage. In this regard, the following are relevant:

- The site supports non-breeding habitats for 24 migratory shorebird species known to occur within the site (Martindale 1982; Ecos unpublished; DSE 2009; Birds Australia 2009a and c).
- The site supports in excess of 40 000 shorebirds at times, and counts of in excess of 20 000 shorebirds have been regularly recorded (Ecos unpublished; Birds Australia 2009c). During the austral winter, approximately 50 per cent of the over-wintering birds (predominately juveniles) remain whilst adults migrate to northern hemisphere breeding grounds (Martindale 1982 in Casanella 1999; Clemens et al. 2007; Ecos unpublished).

The Ramsar site meets Section 75 requirements in terms of its function as a habitat for non-migratory species, in respect to provision of the following values:

- The site provides breeding habitat for a variety of waterbirds, including several species listed as threatened at the State level and/or occurring in significant numbers
- Habitat for significant aggregations of waterbirds during post-breeding, and as a refuge during adverse environmental conditions - black swan (*Cygnus atracus*), grey teal (*Anas gracilis*), and chestnut teal (*Anas castanea*). The western part of Corner Inlet, where areas of seagrass, mangroves and coastal saltmarsh provide habitat are likely to support highest values for these species (Norman 1982; Clemens et al. 2007; DSE 2003; Ecos unpublished).

Based on the above, the site meets this criterion.

Criterion 5 - Met

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

A wetland can be declared as internationally significant if it regularly supports 20 000 waterbirds. Based on *Ramsar Handbook for Wise Use of Wetlands 14* (Ramsar Convention Secretariat 2007), this criterion can apply to a total waterbird assemblage, or to individual species, but should not include non-native waterbirds.

With regards to shorebirds, annual counts have been undertaken since 1981 (Birds Australia 2009c). Consistently, counts between 1981 and 2003 indicate that the site has supported in excess of 40 000 shorebirds at times (Ecos unpublished; Birds Australia 2009c). Based on DSE count data, maximum annual migratory shorebird counts in the period 1986 to 1990 exceeded 20 000 birds in all but one of these years (range = 19 940 to 29 007), thereby meeting this criterion. Birds Australia (2009c) also recorded a maximum annual abundance of migratory species of 42 811 birds, with the mean annual abundance of migratory species being 31 487 birds (derived from 28 years of data collection from 1980 to 2008).

Non-shorebirds species that are present in notable (potentially significant) abundance include black swan (*Cygnus atracus*), grey teal (*Anas gracilis*) and chestnut teal (*Anas castanea*) (Norman 1982; Peter 1991; Ecos unpublished). Refer to Section 3.3.2 for further details.

Based on the above, the site meets this criterion.

Criterion 6 – Met

A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird.

Existing data demonstrates that the one per cent species population threshold has been regularly exceeded for a variety of waterbird species within the site (Minton 1997; Taylor and Minton 2006; Wetlands International 2006; Bamford et al. 2008; Ecos unpublished; Birds Australia 2009c), including:

- pied oystercatcher (*Haematopus ostralegus*): one per cent = 110 birds; regular counts averaging 893 birds (Ecos unpublished); maximum annual count exceeded one percent threshold in four of five years between 1988 to 1992 (DSE 2009)
- sooty oystercatcher (*Haematopus fuliginosus*): one per cent = 40 birds; regular counts averaging 285 birds (Ecos unpublished); maximum annual count exceeded one percent threshold in three of the five years between 1984 to 1988 (DSE 2009)
- Pacific gull (*Larus pacificus*): one per cent = 50 birds; counts of between 100 and 400 birds recorded (Ecos unpublished); maximum annual count exceeded one percent threshold in three of the five years between 1977 to 1981 (DSE 2009)
- fairy tern (*Sterna nereis nereis*): one per cent = 25 birds; counts of up to 82 birds recorded; maximum annual count exceeded one percent threshold in four of the five years between 1987 to 1991 (DSE 2009)
- red knot (*Calidris canutus*): one per cent = 2200 birds; counts between 1500 and 9000 birds recorded with an average of 2842 birds (Ecos unpublished); maximum annual count exceeded one percent threshold in three of the five years between 1987 to 1991 (DSE 2009)
- red-necked stint (*Calidris ruficollis*): one per cent = 3250 birds; regular counts averaging 13 765 birds (Ecos unpublished), maximum annual count exceeded one percent threshold in three of the five years between 1986 to 1990 (DSE 2009)

- chestnut teal (*Anas castanea*): one per cent = 1000 birds; counts exceeding this recorded on three occasions (Ecos unpublished); maximum annual count exceeded one percent threshold in all years between 1980 to 1992 (DSE 2009)

Data also indicates that additional species have been present in numbers exceeding the one per cent population threshold, though data deficiencies prevent confirmation that such species have “regularly” occurred on the site in such abundances so as to fulfil the criterion requirements. These species include the following (Wetlands International 2006; OBPR 2006; Bamford et al. 2008; Ecos unpublished; BA 2009c):

- curlew sandpiper (*Calidris ferruginea*): one per cent = 1800 birds; regular average annual count = 2588 birds (Ecos unpublished), maximum annual count exceeded one per threshold in one of five years between 1988 to 1992 (DSE 2009)
- bar-tailed godwit (*Limosa lapponica*): one per cent = 3250 birds; regular counts averaging 9727 birds (Ecos unpublished); maximum annual count exceeded one percent threshold in two of the five years between 1986 to 1990 (DSE 2009)
- eastern curlew (*Numenius madagascariensis*): one per cent = 1400 birds; regular counts averaging 1971 birds (Ecos unpublished); maximum annual count exceeded one percent threshold in one of the five years between 1985 to 1989 (DSE 2009)
- double-banded plover (*Charadrius bicinctus*): one per cent = 500 birds; regular counts recorded between 500 and 950 birds (Ecos unpublished); maximum annual count exceeded one percent threshold in one of the five years between 1982 to 1986 (DSE 2009)
- black swan (*Cygnus atracus*): one per cent = 10 000 birds; maximum annual counts were at or greater than 10 000 birds in two years (1977 and 1990) but below this value in all other years (DSE 2009).

Based on the above, the site meets this criterion. Refer to Section 3.3.2 for further details.

Criterion 7 – Not Met

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.

The *Ramsar Handbook for Wise Use of Wetlands 14* (Ramsar Convention Secretariat 2007) emphasises that the term diversity under this criterion can encompass number of life-history stages, species interactions and complexity of fish-environmental interactions.

Corner Inlet contains an appreciable number of fish species, with approximately 171 fish species represented (Ecos unpublished). Furthermore, the site also supports a wide variety of life-history stages for many species (that is, eggs, larvae, recruitment sites, spawning sites). The fish assemblages of the site are comprised of species with different life-history characteristics, including potadromous (entirely freshwater) species, to catadromous (requiring marine and freshwaters to complete life-cycle) and fully marine species.

While the site provides habitat for a wide range of fish species that is undoubtedly important a local scale, there is insufficient data to assess the significance of this level of biodiversity at a provincial bioregional scale. Until such time that biodiversity data become available for other estuaries in the bioregion, this part of the criterion can not be directly assessed.

Ramsar Handbook for Wise Use of Wetlands 14 (Ramsar Convention Secretariat 2007) also considers endemism as an important element of biodiversity. No fish species that are endemic to the Southeast IMCRA Transition bioregion are known to occur exclusively at the site.

In reference to the above key elements, it is assessed that there is insufficient data to determine the applicability of the criterion.

Criterion 8 – Met

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.

Corner Inlet provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species of direct and indirect fisheries significance. These fish have important fisheries resource values both within and external to the site.

Section 70 of the *Ramsar Handbook for Wise Use of Wetlands 14* (Ramsar Convention Secretariat 2007) recognises two key elements under criterion 8:

1. Identification of shallow coastal wetland habitats that are important spawning, nursery and feeding grounds.
2. Identification of riverine, swamp and lake fish habitat that are important spawning and migratory pathways.

With respect to the first element, it is noted that the site supports numerous species of direct fisheries importance including King George whiting (*Sillaginodes punctatus*), blueweed whiting (*Halletta semifasciata*), Australian salmon (*Arripis* spp.), greenback flounder (*Rhombosolea tapirina*), southern garfish (*Hyporhamphus melanochir*), yelloweye mullet (*Aldrichetta forsteri*), silver trevally (*Pseudocaranx dentex*), black bream (*Acanthopagrus butcheri*), sand flathead (*Platycephalus bassensis*), dusky flathead (*Platycephalus fuscus*), rock flathead (*Leviprora laevigatus*), leatherjackets (several species), snook (*Sphyræna novaehollandiae*), short-finned eel (*Anguilla australis*) and gummy shark (*Mustelus antarcticus*). Notable shellfish species include calamari and arrow squid, whereas the sand crab fishery is highly variable and largely opportunistic (see Section 3.7.2).

All of the above species are either estuarine residents or depend on estuaries in some way during their life cycle. Many of the fish and crustacean species listed above spend their juvenile stages in shallow nearshore waters of the site, particularly around seagrass and intertidal habitats. These species also spawn in inshore waters, particularly near the surf zone and in sandy channels within the boundaries of the Ramsar site (see Section 3.7.2). The threatened Australian grayling (*Prototroctes maraena*), which has a marine juvenile life-history stage, would also use the site to complete its life-cycle (see Section 3.7.1).

Based on the above, the site meets this criterion. Note that Section 3.7.2 provides a more detailed account of fish habitat values of the site.

Criterion 9 – Not Met

A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

Criterion 9 relates to non-avian wetland taxa including, *inter alia*, mammals, reptiles, amphibians, fish and aquatic macro-invertebrates.

In interpreting the application of criterion 9 to the Ramsar site, the *Ramsar Handbook for Wise Use of Wetlands 14* (Ramsar Convention Secretariat 2007) indicates that reliable population size limits from published sources must be included in the justification for the application of this criterion. While Corner Inlet may support more than one per cent of the individuals in a biogeographic population of several non-avian species, there is insufficient published data about populations across the biogeographic region to verify this (a stated requirement in the *Ramsar Handbook for Wise Use of Wetlands 14* (Ramsar Convention Secretariat 2007)). Additionally, investigation of survey data for key non-avian wetland species within Corner Inlet as part of the current study has shown such data is largely incomplete and forms an information gap.

On this basis, justification for inclusion of the site on the basis of criterion 9 has not been recommended at this time.