

Corner Inlet Ramsar site

Ecological Character Description

June 2011

Chapters 7 – 8 and Appendices

Other chapters can be downloaded from:

[www.environment.gov.au/water/publications/environmental/wetlands/13-ecd.html](http://www.environment.gov.au/water/publications/environmental/wetlands/13-ecd.html)

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# Glossary

**Acceptable change**, means the variation that is considered acceptable in a particular measure or feature of the ecological character of the wetland. Acceptable variation is that variation that will sustain the service, component or process to which it refers.

**Aquatic/marine fauna**, the context of this report relates to fauna species that spend all or the majority of their life cycle in or underwater. As such this grouping primarily relates to fish, marine reptiles, aquatic mammals such as dugong and cetaceans, and aquatic/marine invertebrates.

**Ecological character**, defined under Resolution IX.1 Annex A: 2005 of the Ramsar Convention as, the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time.

**Epiphytes**, means algae, larger in size than periphyton, that grows on seagrass leaves.

**IMCRA bioregion**, refers to the Interim Marine and Coastal Regionalisation for Australia (Mesoscale) to the 200 meter isobath and derived from biological and physical data, (for example, coastal geomorphology, tidal attributes, oceanography, bathymetry and intertidal invertebrates).

**Microphytobenthos**, means the surface biofilms of photosynthetic micro-algae and bacteria.

**National ECD Framework**, refers to the document entitled, ‘National Framework and Guidance for Describing the Ecological Character of Australia’s Ramsar Wetlands – Module 2 of the National Guidelines for Ramsar Wetlands – Implementing the Ramsar Convention in Australia’ (DEWHA 2008) and its successive documents as endorsed by the Natural Resource Management (NRM) Ministerial Council.

**Periphyton**, means thin biofilms of microbes growing on seagrass leaves.

**Ramsar Nomination Criteria**, refers to the nine criteria for the listing of a site as internationally significant under the provisions of the Ramsar Convention. Also referred throughout the report as the nomination criteria for the site.

**Resident species**, in the context of waterbirds, are species that remain permanently in Australia but undertake localised migrations often in response to seasonal or climatic events.

**Sedimentation**, means the process of deposition of sediment of any size. This is often colloquially referred to as siltation, but this term implies that only silt-sized material is deposited.

**Shorebirds,** as used in this report, refers to both resident and migratory species which are ecologically dependent upon wetlands from the following families: Scolopacidae; Burhinidae; Haematopodidae; Recurvirostridae; Charadriidae; and Glareolidae. Shorebirds form a sub-set of the waterbird grouping.

**Values**, means the perceived benefits to society, either direct or indirect that result from wetland functions. These values include human welfare, environmental quality and wildlife support.

**Waterbirds,** as used in this report, refers to those species which are ecologically dependent upon wetlands from the following families: Anseranatidae, Anatidae, Podicipedidae, Anhingidae, Phalacrocoracidae, Pelecanidae, Ardeidae, Threskiornithidae, Ciconiidae, Gruidae, Rallidae, Scolopacidae, Rostratulidae, Jacanidae, Burhinidae, Haematopodidae, Recurvirostridae, Charadriidae, Glareolidae, Laridae and Sternidae (after Kingsford and Norman 2002; Wetlands International 2006). Only those species of gulls (Laridae) and terns (Sternidae) which make extensive use of shallow, inshore waters or inland wetlands are included. Whilst at least some other species of other families traditionally regarded as “seabirds” (that is, Spheniscidae, Phaethontidae, Sulidae, Fregatidae, Stercorariidae and Alcidae) also make use of shallow, inshore waters (and thus could be therefore be considered as waterbirds), these have not been included in the waterbird group (following precedent within Wetlands International 2006).

**Wetlands**, is used in this report in the context of the definition under the Ramsar Convention which includes, areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

**Wetland-dependent terrestrial fauna**, in the context of this report relates to fauna species that occur within or otherwise are dependent on wetland habitats but do not spend the majority of their life cycle underwater (for example, non-aquatic species). As such this grouping primarily relates to birds, amphibians such as frogs, non-aquatic mammals such as water mouse, non-aquatic reptiles and terrestrial invertebrates.

**Wetland flora**, in the context of this report relates to flora species that are characterised as wetland or wetland-dependent species or populations.

**Wetland ecosystem components**, as defined in the National ECD Framework, are the physical, chemical and biological parts or features of a wetland.

**Wetland ecosystem processes**, as defined in the National ECD Framework, are the dynamic forces within the ecosystem between organisms, populations and the non-living environment. Interactions can be physical, chemical or biological.

**Wetland ecosystem benefits or services** (includes the term ecosystem services), as defined in the National ECD Framework, are the benefits that people receive from wetland ecosystems. In general, benefits and services are based on or underpinned by wetland components and processes and can be direct (for example, food for humans or livestock) or indirect (for example, wetland provides habitat for biota which contribute to biodiversity).

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Detailed Methodology

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

This report updates and replaces an unpublished draft ECD document for the site prepared by the Ecos Consortium (Ecos unpublished). However, the draft Ecos document was regarded as an important source of technical information about the site and where appropriate, figures, data analysis and conclusions drawn from the draft Ecos document have been referenced in this ECD report.

**A1 Steering Committee**

A Steering Committee was created as part of the study and was chaired independently. The organisations represented on the Steering Committee were as follows:

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| **Department or Organisation** |
| Independent Chair |
| Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) |
| Department of Sustainability and Environment (DSE) |
| Parks Victoria |
| Department of Defence |
| Gippsland Coastal Board |
| West Gippsland Catchment Management Authority |

**A2 Methodology – Information Collation and Review Stage**

The first step in ECD preparation as outlined in the National ECD Framework is to identify the wetland services/benefits, wetland components and wetland processes present in the Ramsar site. These key terms are defined in Section 3 of the Report and the Glossary. This was initiated by undertaking a process of information collation and literature review.

As part of the information collation phase, literature and existing data relevant to the study area (site boundary and surrounds) were collated and reviewed. Relevant existing information was sourced from the following:

* published scientific papers
* database records (EPBC, DSE, etc.)
* quantitative data (Birds Australia, Victorian EPA, etc.)
* mapping products supplied by the DSE and Parks Victoria (vegetation and wetland mapping)
* management plans, strategies and other policy documents
* grey literature from internet searches and other sources of data.

Each article of information was collated to a cursory level sufficient to determine its relevance to the study. The collected information was then reviewed to prioritise and identify information of direct relevance to the ECD.

As part of the information collation phase, key information sources to be used in the study were presented to the project Steering Committee and gaps were identified on the basis of these reviews. In some cases, additional information was supplied directly by Steering Committee representatives.

**A3 Selection of Critical Components, Processes and Services/Benefits**

A wide range of ecosystem components, processes and services/benefits were seen as being represented within the Ramsar site. Following the method within the National ECD Framework, the assignment of a given wetland component, process or service/benefit as critical was determined with reference to the following criteria:

* The component, process or service/benefit is an important determinant of the uniqueness of the site, or is widely accepted as representing a particularly outstanding example of an environmental value supported by the site.
* The component, process or service/benefit is important for supporting one or more of the Ramsar Nomination Criteria under which the site was listed.
* A change in a component, process or service/benefit is reasonably likely to occur over short or medium times scales (less than 100 years).
* A change to the component, process or service/benefit would result in a fundamental change in ecological values of the site.

The views of the Steering Committee were also considered in the assignment of critical elements. Justification for inclusion of critical and supporting components, processes or services/benefits is provided in the body of this report.

In selecting key species/groups that underpin critical components, the following methods were considered:

Flora Species

In nominating particular wetland flora species or communities for consideration under the critical components, the following considerations were applied:

* Species should generally occur in aquatic environments (for example, macrophytes) or are otherwise considered to be wetland-associated species or communities.
* Species or communities should be listed as threatened (that is, vulnerable or endangered) at the national (threatened under EPBC Act) and/or international (IUCN) level or are considered to be particularly noteworthy or critical from a regional biodiversity perspective (refer to Nomination Criterion 3). This includes species or communities that are perceived by the authors to be iconic to the site, or are designated as threatened under Victorian legislation (endangered or vulnerable at a State/Territory scale).

Fauna Species

In nominating particular fauna species/groups for consideration under the critical components, the following considerations were applied:

1. Species should generally occur in aquatic or marine environments or are otherwise considered to be wetland-dependent terrestrial species (refer Glossary for definitions of these terms and Appendix C for list of species).
2. Species should be either:
   * designated as threatened (for example, endangered or vulnerable) at a national scale (under the EPBC Act) or international scale (under IUCN Red List)
   * particularly noteworthy or critical from a regional biodiversity perspective. This includes species that are perceived by the authors to be iconic to the site, or are designated as threatened under Victorian legislation (endangered or vulnerable at a State/Territory scale).
3. Given the boundaries of the Ramsar site are largely confined to near-shore areas or internal waters, emphasis has been placed on inclusion of those species that use the site as core habitat, have significant population numbers and spend a large proportion of their life cycle within the site boundaries. This excludes vagrant species of conservation significance such as whales, sharks and migratory seabirds that may only occur in the Ramsar site infrequently but for which species records within the site exist.

**A4 Derivation of Limits of Acceptable Change**

Limits of Acceptable Change were derived using a staged approach as follows:

* determine values of the site. These represent the critical components and/or services/benefits
* identify critical processes underpinning site values
* describe patterns in natural variability in critical components, processes and services/benefits indicators
* define the relative magnitude of acceptable change. The relative magnitude of acceptable change was determined on the basis of (i) an assessment of criticality of the site to the maintenance of species populations or habitats, based on known or likely patterns in geographic distribution, abundance and criticality of the site to maintaining the survival of a species; (ii) patterns (short-term and long-term) in natural variability; and (iii) a qualitative assessment of the vulnerability of changes outside bounds of natural variability
* derive specific limits of acceptable change. The broad relative magnitude of acceptable change definitions was used to describe specific limits of acceptable change.

The specific values of the site was determined on the basis of (i) known or likely patterns in the distribution and abundance of species and habitats that comprise the critical components, processes and services/ benefits of the site, and (ii) expert opinion and or empirical data describing the criticality of the site to maintaining the survival of a species. Three levels of criticality were derived based on these factors (Least, Moderate and Highest Concern), as described in Table A-1 below.

Table A-1 Categories Describing Importance of the Site to Maintaining Habitats and Species that Underpin the Critical Services/Benefits and Components

|  |  |  |
| --- | --- | --- |
| **Distribution and criticality to populations** | **Abundant** | **Uncommon** |
| Widespread globally and nationally, life-history functions supported in many areas elsewhere (species). | 1a | 2b |
| High diversity feature (habitat and community descriptor). | 1b | 2c |
| Habitat specialist with disjunct and very limited number of populations globally and nationally (species). | 3a | 3d |
| May be widespread nationally or regionally but is a critical breeding, staging or feeding site that is critical to survival of population (habitat and species). | 3b | 3e |
| Limited to bioregion but found in numerous basins, and is not known to be critical to survival of a species (habitat and species). | 2a | 3f |
| Limited to bioregion, found in a small number of basins and has limited distribution in the site (species). | 3c | 3g |

Where least concern = 1 (green), of concern = 2 (yellow), most concern = 3 (orange)

The relative magnitude of acceptable change was then determined based on:

* The categories describing site values/importance described in Table A-1 above.
* Whether species/habitats that underpin the critical components or services/benefits are known or likely to be highly sensitive/intolerant to changes in environmental conditions.
* Known/likely patterns in natural temporal variability of indicators in the short-term (based on inter-annual cycles or episodic disturbance) and long-term (based on processes operating over time scales measured in decades).
* A high level qualitative assessment of the consequences associated with changes in parameters outside natural variability was undertaken. Five consequence categories were derived, and are based in part on general risk categories developed by the SCFA – FRDC Project Team (2001) for the Risk Assessment Process for Wild Capture Fisheries (Version 3.2) (refer Table A-2).
* Consideration of patterns in natural variability, site values/importance and the consequence ratings for assessing sensitivity to change were used to derive three relative magnitudes of acceptable change categories: (i) no change; (ii) small change; (iii) moderate to large change. These are shown in Table A-3.

**Table A-2 Defining Impact Magnitude**

| **Category** | **Habitat** **affected/modified** | **Key species** | **Ecosystem functioning** |
| --- | --- | --- | --- |
| Major | greater than 60 per cent habitat | Mortality likely local extinction. | Total ecosystem collapse. |
| High | 30 to 60 per cent | Mortality may affect recruitment and capacity to increase. | Measurable impact to functions, and some functions are missing/ declining/ increasing outside historical range and/or facilitate new species to appear. |
| Moderate | five to 30 per cent | Mortality within some spp. Levels of impact at the maximum acceptable level. | Measurable changes to ecosystem components but no loss of functions (no loss of components). |
| Minor | less than five per cent | Affected but no impact on local population status (for example, stress or behavioural change to individuals). | Keystone species not affected, minor changes in relative abundance. |
| Negligible | less than one per cent | No impact. | Possible changes, but inside natural variation. |

Table A-3 Magnitude of Acceptable Change Categories for LAC Indicators

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Impact Significance** | **Level 3 species or habitat** | **Level 2 species or its habitat** | | **Level 1 species or its habitat** | | | |
| **Short-term, localised** | **Long-term or multiple areas** | **Short-term, localised** | **Short-term, multiple areas** | **Long-term, localised** | **Long-term, multiple areas** |
| Major | No change | No change | No change | No change | No change | No change | No change |
| High | No change | No change | No change | Moderate change | No change | No change | No change |
| Moderate | No change | Small change | No change | Moderate change | Small change | Small change | No change |
| Minor | No change | Moderate change | Small change | Moderate change | Moderate change | Moderate change | Small change |

NLWRA (2001) Database Results for Estuaries in the IMCRA Bioregion

| **STATE** | **ESTUARYNAME** | **DLAT** | **DLONG** | **CONDITION** | **CLASSIFICATION** | **BARRIER\_BACKBARRIER** | **CENTRAL\_BASIN** | **FLUVIAL\_BAYHEAD\_DELTA** | **FLOOD\_EBB\_DELTA** | **INTERTIDAL\_FLATS** | **MANGROVE** | **SALTMARSH\_SALTFLAT** | **TIDAL\_SANDBANKS** | **CHANNEL** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| VIC | CORNER INLET | -38.781 | 146.484 | largely unmodified | tide dominated | 10.71301 |  |  | 10.81198 | 387.10413 | 18.59332 | 65.51435 | 6.89234 | 163.49541 |
| VIC | WESTERN PORT BAY | -38.429 | 145.216 | modified | tide dominated |  |  | 4.13857 | 3.46703 | 90.57019 | 15.36289 | 29.65951 | 3.69584 | 577.74547 |
| VIC | ANDERSON INLET | -38.65 | 145.721 | modified | wave dominated | 0.4693 |  | 0.83757 | 2.71268 | 13.25415 | 0.96114 | 5.58578 | 0.21311 | 7.7043 |
| VIC | SHALLOW INLET | -38.871 | 146.184 | largely unmodified | wave dominated | 2.99533 |  |  | 0.42845 | 7.04799 |  | 11.67968 | 0.11473 | 2.98393 |
| VIC | JACK SMITH LAKE | -38.497 | 147.04 | near pristine | wave dominated |  | 1.27068 | 0.14518 | 0.91885 | 6.17077 |  | 5.17006 |  | 0.53759 |
| VIC | MALLACOOTA INLET | -37.569 | 149.763 | near pristine | wave dominated | 0.86063 | 19.76209 | 1.87327 | 0.95698 | 3.86887 |  | 1.00609 | 0.06924 | 5.77364 |
| NSW | CLYDE RIVER/BATEMANS BAY | -35.747 | 150.255 | largely unmodified | tide dominated |  |  | 5.20938 | 1.24143 | 3.68788 | 0.90927 | 1.35359 | 0.02039 | 45.55038 |
| NSW | JERVIS BAY | -35.107 | 150.787 | largely unmodified | tide dominated | 0.17871 |  | 1.0786 | 0.07506 | 3.28999 | 1.87997 | 3.5002 | 0.13338 | 120.71644 |
| VIC | BARWON RIVER | -38.286 | 144.501 | modified | wave dominated | 0.3792 | 8.33747 | 0.48088 | 0.43088 | 1.91563 | 0.22153 | 11.98214 |  | 2.02118 |
| VIC | SYDENHAM INLET | -37.781 | 149.017 | largely unmodified | wave dominated | 0.54957 | 9.91461 | 0.67093 | 0.1674 | 1.44033 |  | 7.11582 |  | 0.94002 |
| VIC | LAKE TYERS | -37.859 | 148.088 | largely unmodified | wave dominated | 0.30295 | 7.49772 | 0.44372 | 0.83073 | 1.29182 |  | 1.58591 |  | 2.04442 |
| VIC | SNOWY RIVER | -37.805 | 148.557 | modified | wave dominated | 0.99424 | 5.03053 | 0.38535 | 0.31979 | 1.2373 |  | 6.04228 |  | 3.87305 |
| NSW | SAINT GEORGES BASIN | -35.184 | 150.594 | modified | wave dominated | 16.06281 | 34.54946 | 3.75395 | 0.56961 | 1.22626 | 0.09454 | 0.93989 | 0.27947 | 2.65214 |
| NSW | LAKE BROU | -36.137 | 150.124 | largely unmodified | wave dominated | 0.50971 | 1.74297 | 1.76547 | 0.531 | 0.95947 |  | 0.00604 |  | 0.27808 |
| NSW | CULLENDULLA CREEK | -35.703 | 150.209 | largely unmodified | tide dominated |  |  |  | 0.20505 | 0.9198 | 0.1182 | 0.24258 |  | 0.19495 |
| NSW | SHOALHAVEN/CROOKHAVEN RIVER | -34.9 | 150.763 | extensively modified | river dominated | 3.00039 | 1.43382 | 101.68148 | 4.4895 | 0.84879 | 3.21867 | 2.62498 |  | 19.69845 |
| NSW | MORUYA RIVER | -35.905 | 150.151 | modified | wave dominated |  | 0.3791 | 2.37487 | 1.70689 | 0.79536 | 0.08839 | 0.35583 | 0.73518 | 2.15223 |
| NSW | DURRAS LAKE | -35.639 | 150.305 | near pristine | wave dominated | 0.18495 | 2.29098 | 0.38839 | 0.24 | 0.78469 |  | 0.36093 |  | 0.36584 |
| VIC | GLENELG RIVER | -38.061 | 140.984 | modified | wave dominated | 0.05892 | 0.40564 |  | 0.15887 | 0.74842 |  | 0.66133 |  | 0.66276 |
| NSW | TUROSS LAKE | -36.067 | 150.132 | modified | wave dominated | 0.53911 | 5.62781 | 17.69419 | 1.74876 | 0.55731 | 0.27517 | 0.93264 | 0.89186 | 5.34083 |
| NSW | BEGA RIVER | -36.706 | 149.984 | modified | wave dominated | 1.79346 | 0.37899 | 1.29864 | 0.34935 | 0.5358 | 0.04052 | 0.02586 | 0.12513 | 2.73705 |
| NSW | PAMBULA LAKE | -36.948 | 149.916 | largely unmodified | wave dominated |  | 1.50871 | 4.97362 | 0.66084 | 0.52338 | 0.26755 |  |  | 1.35659 |
| NSW | TABOURIE LAKE | -35.438 | 150.411 | modified | wave dominated | 1.32074 | 0.71653 | 0.31927 | 0.28981 | 0.47685 |  | 0.40452 |  | 0.53255 |
| NSW | WAGONGA INLET | -36.214 | 150.132 | modified | wave dominated | 0.13062 | 4.17188 | 1.22045 | 1.54613 | 0.42762 | 0.06338 | 0.01459 |  | 0.53121 |
| VIC | HOPKINS RIVER | -38.399 | 142.509 | modified | river dominated | 0.04896 | 0.25273 |  | 0.03891 | 0.4208 |  | 0.30376 |  | 1.32503 |
| VIC | TAMBOON INLET | -37.779 | 149.148 | largely unmodified | wave dominated | 0.30325 | 5.74239 | 0.40109 | 0.01528 | 0.38371 |  | 1.66415 | 0.08147 | 0.97658 |
| VIC | WINGAN INLET | -37.749 | 149.513 | near pristine | wave dominated | 0.06507 |  | 0.11934 | 0.28279 | 0.37995 |  | 0.73667 |  | 0.71609 |
| NSW | SWAN LAKE | -35.201 | 150.561 | largely unmodified | wave dominated | 1.67602 | 4.12464 |  | 0.9245 | 0.37213 |  | 0.08629 |  | 0.18055 |
| NSW | TWOFOLD BAY / EDEN | -37.078 | 149.947 | modified | tide dominated | 1.24387 | 0.53852 | 4.17022 | 1.33063 | 0.35338 | 0.02259 | 0.30641 | 0.2425 | 34.45343 |
| NSW | LAKE CONJOLA | -35.269 | 150.508 | modified | wave dominated | 1.85494 | 4.64153 | 0.61758 | 0.77924 | 0.33817 | 0.31331 | 0.03405 |  | 0.80382 |
| VIC | MOYNE RIVER | -38.384 | 142.242 | modified | wave dominated |  | 0.8029 | 0.26745 | 0.02379 | 0.31764 |  | 0.50733 | 0.01364 | 0.27154 |
| NSW | WOLLUMBOOLA LAKE | -34.94 | 150.776 | largely unmodified | wave dominated | 2.6167 | 4.93458 | 0.76852 | 0.55523 | 0.31638 | 0.04439 |  |  | 0.21167 |
| NSW | MERIMBULA LAKE | -36.896 | 149.922 | modified | wave dominated | 2.99472 | 2.26939 | 0.56467 | 2.02111 | 0.30402 |  |  |  | 0.4263 |
| NSW | NARRAWALLEE INLET | -35.302 | 150.475 | largely unmodified | wave dominated | 0.58307 |  |  | 0.20642 | 0.2777 | 0.24737 | 0.71278 |  | 0.40903 |
| NSW | BERMAGUI RIVER | -36.425 | 150.065 | modified | wave dominated | 0.20377 | 0.19928 | 0.97496 | 0.39799 | 0.27543 | 0.43458 | 0.3467 |  | 0.63618 |
| NSW | COILA LAKE | -36.048 | 150.139 | modified | wave dominated | 1.50359 | 6.1651 | 0.70075 | 0.38347 | 0.27522 |  | 0.05586 |  | 0.10125 |
| NSW | MINNAMURRA RIVER | -34.628 | 150.861 | modified | river dominated | 0.40948 |  |  | 0.09312 | 0.27489 | 0.93543 | 0.52907 |  | 0.3727 |
| NSW | MEROO LAKE | -35.484 | 150.391 | near pristine | wave dominated | 0.15579 | 0.63311 | 0.30066 |  | 0.25367 |  | 0.39106 |  | 0.15577 |
| NSW | TOMAGA RIVER | -35.837 | 150.185 | largely unmodified | river dominated | 0.15074 |  | 0.4281 | 0.09261 | 0.2407 | 0.19049 | 0.50033 |  | 0.69287 |
| VIC | FITZROY RIVER | -38.263 | 141.85 | modified | wave dominated | 0.0538 |  |  |  | 0.20277 |  |  | 0.0259 | 0.57285 |
| NSW | WAPENGO LAGOON | -36.635 | 150.021 | largely unmodified | wave dominated |  | 1.02044 | 1.81334 | 1.2867 | 0.18518 | 0.32905 | 0.31372 |  | 0.37153 |
| NSW | WALLAGOOT LAKE | -36.795 | 149.959 | largely unmodified | wave dominated | 0.83244 | 3.10318 | 0.78572 | 0.81916 | 0.18359 |  |  |  | 0.26742 |
| NSW | NADGEE LAKE AND INLET | -37.469 | 149.973 | near pristine | wave dominated | 0.19439 | 0.7555 | 0.06369 | 0.22166 | 0.17326 |  | 1.08824 |  | 0.04352 |
| NSW | BERRARA CREEK | -35.209 | 150.548 | largely unmodified | wave dominated |  |  |  | 0.02972 | 0.15943 |  |  | 0.10808 | 0.23421 |
| VIC | ANGLESEA RIVER | -38.413 | 144.191 | modified | river dominated | 0.02066 |  |  | 0.01919 | 0.15637 |  |  |  | 0.11086 |
| VIC | BARHAM RIVER | -38.766 | 143.668 | modified | wave dominated | 0.01129 |  |  |  | 0.14536 |  |  |  | 0.13568 |
| NSW | TOWAMBA RIVER | -37.112 | 149.913 | largely unmodified | wave dominated | 0.19625 |  | 3.42478 | 0.90409 | 0.12922 |  | 0.24554 | 0.2425 | 1.45473 |
| NSW | CURRAMBEEN CREEK | -35.037 | 150.671 | largely unmodified | river dominated | 0.17871 |  |  |  | 0.11391 | 1.36417 | 0.79421 | 0.15286 | 0.54301 |
| NSW | BURRILL LAKE | -35.39 | 150.445 | largely unmodified | wave dominated | 0.66203 | 3.39179 | 0.86128 | 0.20873 | 0.11232 |  | 0.0596 | 0.20922 | 0.33052 |
| NSW | WONBOYN RIVER | -37.25 | 149.966 | largely unmodified | wave dominated | 0.2825 | 0.97631 | 0.09755 | 1.07487 | 0.10481 |  | 0.65773 |  | 1.64798 |
| NSW | MOLLYMOOK CREEK | -35.334 | 150.475 | largely unmodified | wave dominated |  |  |  |  | 0.09467 |  | 0.01012 |  | 0.01652 |
| VIC | PAINKALAC CREEK/AIREYS INLET | -38.467 | 144.094 | largely unmodified | wave dominated | 0.00711 |  |  |  | 0.0945 |  | 0.0111 |  | 0.09726 |
| VIC | SAINT GEORGE RIVER | -38.569 | 143.965 | near pristine | wave dominated |  |  |  |  | 0.08793 | 0.03006 | 0.02087 |  | 0.00301 |
| VIC | SKENES CREEK | -38.725 | 143.712 | modified | wave dominated |  |  |  | 0.01003 | 0.08013 |  |  |  | 0.01602 |
| NSW | MERINGO CREEK AND LAGOON | -35.978 | 150.15 | largely unmodified | wave dominated | 0.14685 | 0.06903 |  | 0.04137 | 0.07878 | 0.00909 |  |  |  |
| VIC | THOMPSON CREEK | -38.305 | 144.377 | modified | wave dominated | 0.12177 |  |  | 0.0156 | 0.07182 |  | 2.86322 |  | 0.41139 |
| NSW | MURRAH LAGOON | -36.495 | 150.054 | largely unmodified | wave dominated | 0.53265 | 0.05888 | 2.90903 | 0.1061 | 0.06789 |  | 0.02009 |  | 0.82762 |
| NSW | NELSON LAGOON | -36.691 | 149.994 | largely unmodified | wave dominated | 0.15487 | 0.18358 | 0.44907 | 0.31058 | 0.0613 | 0.2174 | 0.44009 |  | 0.29826 |
| NSW | TERMEIL LAKE | -35.462 | 150.395 | near pristine | wave dominated | 0.04461 | 0.35115 | 0.13238 | 0.05896 | 0.04778 |  | 0.25146 |  | 0.11481 |
| VIC | TIDAL RIVER | -39.035822 | 146.31218 | largely unmodified | wave dominated | 0.07508 |  |  | 0.06019 | 0.0445 |  | 0.05981 |  | 0.06227 |
| VIC | SHERBROOK RIVER | -38.644 | 143.057 | largely unmodified | wave dominated | 0.00711 |  |  |  | 0.04393 |  |  |  | 0.02863 |
| NSW | BUNGA LAGOON | -36.547 | 150.055 | largely unmodified | wave dominated | 0.13795 | 0.08782 | 0.08158 | 0.01469 | 0.04194 |  |  |  | 0.03391 |
| NSW | CONGO CREEK AND LAGOON | -35.953 | 150.157 | largely unmodified | wave dominated | 0.12132 |  |  | 0.04457 | 0.03597 |  | 0.03765 |  | 0.10791 |
| NSW | BARAGOOT LAKE | -36.471 | 150.065 | largely unmodified | wave dominated | 0.31216 | 0.47082 | 0.18258 | 0.05383 | 0.034 |  |  |  |  |
| NSW | TILBA TILBA LAKE | -36.339 | 150.1 | largely unmodified | wave dominated | 0.48394 | 0.79475 | 0.18942 | 0.2176 | 0.0331 |  | 0.04784 |  | 0.13862 |
| NSW | NANGUDGA LAKE | -36.261 | 150.143 | largely unmodified | wave dominated | 0.2069 | 0.32358 | 0.05481 | 0.34174 | 0.03304 |  |  |  | 0.18646 |
| VIC | GELLIBRAND RIVER | -38.707 | 143.157 | modified | wave dominated | 0.011 | 0.07912 |  | 0.03474 | 0.03161 |  | 2.05052 |  | 0.18932 |
| VIC | RED RIVER | -37.727 | 149.563 | near pristine | wave dominated | 0.06418 | 0.05363 | 0.04748 | 0.03546 | 0.02974 |  | 0.11225 |  | 0.1093 |
| NSW | ULLADULLA HARBOUR/MILLARDS CREEK | -35.357 | 150.485 | extensively modified | wave dominated |  |  |  |  | 0.02968 |  |  |  | 0.56358 |
| NSW | CURALO LAGOON | -37.048 | 149.921 | extensively modified | wave dominated | 0.37575 | 0.42143 | 0.24083 | 0.25225 | 0.02855 | 0.02259 | 0.03181 |  | 0.12632 |
| VIC | ERSKINE RIVER | -38.532 | 143.979 | largely unmodified | wave dominated | 0.00723 |  |  |  | 0.028 | 0.04256 |  |  | 0.02529 |
| VIC | JAMIESON RIVER | -38.596 | 143.919 | largely unmodified | wave dominated | 0.02147 |  |  | 0.01896 | 0.02787 |  |  |  | 0.03154 |
| NSW | LAKE TAROURGA | -36.115 | 150.134 | near pristine | wave dominated | 0.07245 | 0.24628 | 0.00344 | 0.02597 | 0.02786 |  | 0.04619 |  | 0.01747 |
| VIC | YEERUNG RIVER | -37.791 | 148.775 | near pristine | wave dominated | 0.05276 |  |  | 0.00133 | 0.0256 |  | 0.06841 |  | 0.19176 |
| NSW | WILLINGA LAKE | -35.5 | 150.391 | near pristine | wave dominated | 0.0897 | 0.13455 | 0.01145 | 0.01307 | 0.0238 |  | 0.31957 |  | 0.14063 |
| NSW | WALLAGA LAKE | -36.365 | 150.079 | largely unmodified | wave dominated | 0.53982 | 7.50976 | 2.0683 | 1.76145 | 0.01965 |  |  |  | 0.45843 |
| NSW | KIANGA LAKE | -36.2 | 150.132 | modified | wave dominated | 0.16067 | 0.1449 |  | 0.01417 | 0.01629 |  |  |  | 0.01947 |
| NSW | CROOKED RIVER AND LAGOON | -34.772 | 150.815 | largely unmodified | wave dominated | 0.11955 |  |  | 0.02292 | 0.01598 |  |  |  | 0.23154 |
| VIC | WYE RIVER | -38.635 | 143.891 | largely unmodified | wave dominated | 0.01752 |  |  |  | 0.01493 |  | 0.00245 |  | 0.02124 |
| NSW | MERRICA RIVER | -37.297 | 149.951 | near pristine | wave dominated | 0.04198 |  |  | 0.02814 | 0.01446 |  | 0.00292 |  | 0.09435 |
| NSW | CANDLAGAN CREEK AND LAGOON | -35.842 | 150.179 | largely unmodified | river dominated | 0.04712 |  |  | 0.04391 | 0.01441 | 0.03652 | 0.09934 |  | 0.11528 |
| VIC | MERRI RIVER | -38.361 | 142.478 | extensively modified | wave dominated |  |  |  | 0.01938 | 0.01427 |  |  |  | 0.21102 |
| NSW | MIDDLE LAGOON | -36.656 | 150.008 | largely unmodified | wave dominated | 0.32455 | 0.40076 | 0.41676 | 0.11697 | 0.01236 | 0.01644 |  |  | 0.17806 |
| NSW | NULLICA RIVER | -37.092 | 149.872 | largely unmodified | wave dominated | 0.58832 | 0.09868 | 0.40679 | 0.13602 | 0.01134 |  |  |  | 0.26109 |
| NSW | BACK LAGOON | -36.883 | 149.929 | modified | wave dominated | 0.33253 | 0.32766 | 0.14619 | 0.02481 | 0.0103 |  |  |  | 0.1042 |
| VIC | KENNETT RIVER | -38.667 | 143.862 | largely unmodified | wave dominated | 0.01909 |  |  |  | 0.00919 |  | 0.00634 |  | 0.02245 |
| NSW | NERRINDILLAH CREEK | -35.229 | 150.532 | largely unmodified | wave dominated | 0.05933 |  |  | 0.00912 | 0.00789 | 0.00786 |  |  | 0.05682 |
| VIC | EASBY CREEK | -37.741 | 149.522 | near pristine | wave dominated | 0.01979 |  |  | 0.01414 | 0.0066 |  | 0.00634 |  | 0.04645 |
| VIC | PORT CAMPBELL RIVER | -38.632 | 142.98 | largely unmodified | tide dominated | 0.01002 |  |  | 0.00965 | 0.00518 |  | 0.09131 |  | 0.0794 |
| VIC | WILD DOG CREEK | -38.734 | 143.689 | largely unmodified | wave dominated | 0.01145 |  |  |  | 0.00452 |  |  |  | 0.02128 |
| VIC | SPRING CREEK | -38.341 | 144.32 | modified | river dominated | 0.00868 |  |  |  | 0.00259 |  | 0.01262 |  | 0.072 |
| NSW | CUTTAGEE LAKE | -36.495 | 150.054 | largely unmodified | wave dominated | 0.23647 | 1.10023 | 0.52849 | 0.09272 |  |  |  |  | 0.23334 |
| VIC | SURREY RIVER | -38.26 | 141.704 | largely unmodified | wave dominated | 0.03366 |  |  |  |  |  | 0.32999 |  | 0.18336 |
| NSW | CORUNNA LAKE | -36.288 | 150.133 | largely unmodified | wave dominated | 0.26975 | 1.79917 | 0.23851 | 0.25567 |  |  |  |  | 0.17244 |
| NSW | LAKE MUMMUGA | -36.162 | 150.129 | largely unmodified | wave dominated | 0.22124 | 1.26345 | 0.17027 | 0.29737 |  | 0.02549 | 0.06433 |  | 0.11977 |
| NSW | WERRI LAGOON | -34.728 | 150.839 | modified | wave dominated | 0.67116 | 0.19309 |  | 0.05174 |  |  |  |  | 0.0283 |
| NSW | KIOLOA LAGOON | -35.549 | 150.383 | largely unmodified | wave dominated | 0.15608 |  |  | 0.02296 |  |  | 0.00399 |  | 0.02549 |
| VIC | ELLIOT RIVER | -38.794 | 143.618 | no assessment | wave dominated | 0.00503 |  |  |  |  |  |  |  | 0.00834 |

Fauna Species List

Note – the following species have been recorded at the site. These lists include wetland-dependent and terrestrial species.

**Mammal List**

|  |  |
| --- | --- |
| **common name** | **Latin name** |
| agile antechinus | *Antechinus agilis* |
| swamp antechinus | *Antechinus minimus* |
| dog | *Canis lupus* |
| eastern pygmy-possum | *Cercartetus nanus* |
| Gould's wattled bat | *Chalinolobus gouldii* |
| chocolate wattled bat | *Chalinolobus morio* |
| spot-tailed quoll | *Dasyurus maculatus* |
| cat | *Felis catus* |
| water rat | *Hydromys chrysogaster* |
| southern brown bandicoot | *Isoodon obesulus obesulus* |
| European hare | *Lepus europeaus* |
| eastern grey kangaroo | *Macropus giganteus* |
| house mouse | *Mus musculus* |
| lesser long-eared bat | *Nyctophilus geoffroyi* |
| Gould's long-eared bat | *Nyctophilus gouldi* |
| European rabbit | *Oryctolagus cuniculus* |
| koala | *Phascolarctos cinereus* |
| common ringtail possum | *Pseudocheirus peregrinus* |
| New Holland mouse | *Pseudomys novaehollandiae* |
| grey-headed flying-fox | *Pteropus poliocephalus* |
| bush rat | *Rattus fuscipes* |
| swamp rat | *Rattus lutreolus* |
| black rat | *Rattus rattus* |
| yellow-bellied sheathtail bat | *Saccolaimus flaviventris* |
| white-footed dunnart | *Sminthopsis leucopus* |
| short-beaked echidna | *Tachyglossus aculeatus* |
| white-striped freetail bat | *Tadarida australis* |
| common brushtail possum | *Trichosurus vulpecula* |
| large forest bat | *Vespadelus darlingtoni* |
| southern forest bat | *Vespadelus regulus* |
| little forest bat | *Vespadelus vulturnus* |
| common wombat | *Vombatus ursinus* |
| red fox | *Vulpes vulpes* |
| black wallaby | *Wallabia bicolor* |

**Reptile List**

| **Common Name** | **Latin Name** |
| --- | --- |
| tree dragon | *Amphibolurus muricatus* |
| lowland copperhead | *Austrelaps superbus* |
| eastern three-lined skink | *Bassiana duperreyi* |
| white-lipped snake | *Drysdalia coronoides* |
| swamp skink | *Egernia coventryi* |
| swamp skink | *Egernia coventryi* |
| southern water skink | *Eulamprus tympanum tympanum* |
| garden skink | *Lampropholis guichenoti* |
| McCoy's skink | *Nannoscincus maccoyi* |
| metallic skink | *Niveoscincus metallicus* |
| tiger snake | *Notechis scutatus* |
| red-bellied black snake | *Pseudechis porphyriacus* |
| southern grass skink | *Pseudemoia entrecasteauxii* |
| glossy grass skink | *Pseudemoia rawlinsoni* |
| weasel skink | *Saproscincus mustelinus* |
| blotched blue-tongued lizard | *Tiliqua nigrolutea* |
| common blue-tongued lizard | *Tiliqua scincoides* |

**Amphibian List**

|  |  |
| --- | --- |
| **Common name** | **Latin Name** |
| common froglet | *Crinia signifera* |
| common froglet | *Crinia signifera* |
| Victorian smooth froglet | *Geocrinia victoriana* |
| southern bullfrog (ssp. unknown) | *Limnodynastes dumerilii* |
|  | *Limnodynastes dumerilii insularis* |
| spotted marsh frog (race unknown) | *Limnodynastes tasmaniensis* |
| southern brown tree frog | *Litoria ewingii* |
| growling grass frog | *Litoria raniformis* |
| southern toadlet | *Pseudophryne semimarmorata* |

**Avifauna List**

| **Common Name** | **Latin Name** |
| --- | --- |
| yellow-rumped thornbill | *Acanthiza chrysorrhoa* |
| striated thornbill | *Acanthiza lineata* |
| yellow thornbill | *Acanthiza nana* |
| brown thornbill | *Acanthiza pusilla* |
| eastern spinebill | *Acanthorhynchus tenuirostris* |
| collared sparrowhawk | *Accipiter cirrhocephalus* |
| brown goshawk | *Accipiter fasciatus* |
| common myna | *Acridotheres tristis* |
| Australian reed-warbler | *Acrocephalus australis* |
| common sandpiper | *Actitis hypoleucos* |
| Australasian darter | *Anhinga novaehollandiae* |
| European skylark | *Alauda arvensis* |
| azure kingfisher | *Alcedo azurea* |
| chestnut teal | *Anas castanea* |
| grey teal | *Anas gracilis* |
| Australasian shoveler | *Anas rhynchotis* |
| Pacific black duck | *Anas superciliosa* |
| red wattlebird | *Anthochaera carunculata* |
| little wattlebird | *Anthochaera chrysoptera* |
| regent honeyeater | *Anthochaera phrygia* |
| Australasian pipit | *Anthus novaeseelandiae* |
| fork-tailed swift | *Apus Pacificus* |
| wedge-tailed eagle | *Aquila audax* |
| cattle egret | *Ardea ibis* |
| intermediate egret | *Ardea intermedia* |
| eastern great egret | *Ardea modesta* |
| white-necked heron | *Ardea Pacifica* |
| short-tailed shearwater | *Ardenna tenuirostris* |
| ruddy turnstone | *Arenaria interpres* |
| dusky woodswallow | *Artamus cyanopterus* |
| hardhead | *Aythya australis* |
| musk duck | *Biziura lobata* |
| sulphur-crested cockatoo | *Cacatua galerita* |
| long-billed corella | *Cacatua tenuirostris* |
| fan-tailed cuckoo | *Cacomantis flabelliformis* |
| brush cuckoo | *Cacomantis variolosus* |
| chestnut-rumped heathwren | *Calamanthus pyrrhopygius* |
| sharp-tailed sandpiper | *Calidris acuminata* |
| sanderling | *Calidris alba* |
| red knot | *Calidris canutus* |
| curlew sandpiper | *Calidris ferruginea* |
| pectoral sandpiper | *calidris melanotos* |
| red-necked stint | *Calidris ruficollis* |
| great knot | *Calidris tenuirostris* |
| gang-gang cockatoo | *Callocephalon fimbriatum* |
| yellow-tailed black-cockatoo | *Calyptorhynchus funereus* |
| European goldfinch | *Carduelis carduelis* |
| European greenfinch | *Carduelis chloris* |
| Cape Barren goose | *Cereopsis novaehollandiae* |
| double-banded plover | *Charadrius bicinctus* |
| greater sand plover | *Charadrius leschenaultii* |
| lesser sand plover | *Charadrius mongolus* |
| red-capped plover | *Charadrius ruficapillus* |
| whiskered tern | *Chlidonias hybridus* |
| white-winged black tern | *Chlidonias leucopterus* |
| Australian wood duck | *Chenonetta jubata* |
| silver gull | *Chroicocephalus novaehollandiae* |
| Horsfield's bronze-cuckoo | *Chrysococcyx basalis* |
| swamp harrier | *Circus approximans* |
| golden-headed cisticola | *Cisticola exilis* |
| banded stilt | *Cladorhynchus leucocephalus* |
| red-browed treecreeper | *Climacteris erythrops* |
| grey shrike-thrush | *Colluricincla harmonica* |
| black-faced cuckoo-shrike | *Coracina novaehollandiae* |
| common cicadabird | *Coracina tenuirostris* |
| white-throated treecreeper | *Cormobates leucophaeus* |
| Australian raven | *Corvus coronoides* |
| little raven | *Corvus mellori* |
| forest raven | *Corvus tasmanicus* |
| stubble quail | *Coturnix pectoralis* |
| brown quail | *Coturnix ypsilophora* |
| grey butcherbird | *Cracticus torquatus* |
| pallid cuckoo | *Cuculus pallidus* |
| black swan | *Cygnus atratus* |
| laughing kookaburra | *Dacelo novaeguineae* |
| varied sittella | *Daphoenositta chrysoptera* |
| cape petrel | *Daption capense* |
| mistletoebird | *Dicaeum hirundinaceum* |
| emu | *Dromaius novaehollandiae* |
| little egret | *Egretta garzetta* |
| white-faced heron | *Egretta novaehollandiae* |
| black-shouldered kite | *Elanus axillaris* |
| black-fronted dotterel | *Elseyornis melanops* |
| galah | *Eolophus roseicapilla* |
| eastern yellow robin | *Eopsaltria australis* |
| white-fronted chat | *Epthianura albifrons* |
| red-kneed dotterel | *Erythrogonys cinctus* |
| little penguin | *Eudyptula minor* |
| brown falcon | *Falco berigora* |
| nankeen kestrel | *Falco cenchroides* |
| Australian hobby | *Falco longipennis* |
| peregrine falcon | *Falco peregrinus* |
| crested shrike-tit | *Falcunculus frontatus* |
| lesser frigatebird | *Fregata ariel* |
| Eurasian coot | *Fulica atra* |
| southern fulmar | *Fulmarus glacialoides* |
| Latham's snipe | *Gallinago hardwickii* |
| dusky moorhen | *Gallinula tenebrosa* |
| black-tailed native-hen | *Gallinula ventralis* |
| buff-banded rail | *Gallirallus philippensis* |
| gull-billed tern | *Gelochelidon nilotica* |
| musk lorikeet | *Glossopsitta concinna* |
| magpie-lark | *Grallina cyanoleuca* |
| Australian magpie | *Gymnorhina tibicen* |
| sooty oystercatcher | *Haematopus fuliginosus* |
| pied oystercatcher | *Haematopus longirostris* |
| white-bellied sea-eagle | *Haliaeetus leucogaster* |
| whistling kite | *Haliastur sphenurus* |
| grey-tailed tattler | *Heteroscelus brevipes* |
| black-winged stilt | *Himantopus himantopus* |
| little eagle | *Hieraaetus morphnoides* |
| white-throated needletail | *Hirundapus caudacutus* |
| welcome swallow | *Hirundo neoxena* |
| tree martin | *Hirundo nigricans* |
| caspian tern | *Hydroprogne caspia* |
| kelp gull | *Larus dominicanus* |
| Pacific gull | *Larus Pacificus Pacificus* |
| swift parrot | *Lathamus discolor* |
| Lewin's rail | *Lewinia pectoralis* |
| yellow-faced honeyeater | *Lichenostomus chrysops* |
| white-eared honeyeater | *Lichenostomus leucotis* |
| white-plumed honeyeater | *Lichenostomus penicillatus* |
| bar-tailed godwit | *Limosa lapponica* |
| black-tailed godwit | *Limosa limosa* |
| northern giant-petrel | *Macronectes halli* |
| pink-eared duck | *Malacorhynchus membranaceus* |
| superb fairy-wren | *Malurus cyaneus* |
| noisy miner | *Manorina melanocephala* |
| little grassbird | *Megalurus gramineus* |
| brown-headed honeyeater | *Melithreptus brevirostris* |
| white-naped honeyeater | *Melithreptus lunatus* |
| little pied cormorant | *Microcarbo melanoleucos* |
| Jacky winter | *Microeca fascinans* |
| Australasian gannet | *Morus serrator* |
| satin flycatcher | *Myiagra cyanoleuca* |
| leaden flycatcher | *Myiagra rubecula* |
| red-browed finch | *Neochmia temporalis* |
| orange-bellied parrot | *Neophema chrysogaster* |
| blue-winged parrot | *Neophema chrysostoma* |
| southern boobook | *Ninox novaeseelandiae* |
| eastern curlew | *Numenius madagascariensis* |
| whimbrel | *Numenius phaeopus* |
| nankeen night heron | *Nycticorax caledonicus* |
| olive-backed oriole | *Oriolus sagittatus* |
| blue-billed duck | *Oxyura australis* |
| olive whistler | *Pachycephala olivacea* |
| golden whistler | *Pachycephala pectoralis* |
| rufous whistler | *Pachycephala rufiventris* |
| fairy prion | *Pachyptila turtur* |
| spotted pardalote | *Pardalotus punctatus* |
| striated pardalote | *Pardalotus striatus* |
| house sparrow | *Passer domesticus* |
| Australian pelican | *Pelecanus conspicillatus* |
| scarlet robin | *Petroica boodang* |
| flame robin | *Petroica phoenicea* |
| pink robin | *Petroica rodinogaster* |
| ground parrot | *Pezoporus wallicus* |
| great cormorant | *Phalacrocorax carbo* |
| black-faced cormorant | *Phalacrocorax fuscescens* |
| little black cormorant | *Phalacrocorax sulcirostris* |
| pied cormorant | *Phalacrocorax varius* |
| common bronzewing | *Phaps chalcoptera* |
| brush bronzewing | *Phaps elegans* |
| common pheasant | *Phasianus colchicus* |
| tawny-crowned honeyeater | *Phylidonyris melanops* |
| New Holland honeyeater | *Phylidonyris novaehollandiae* |
| crescent honeyeater | *Phylidonyris pyrrhoptera* |
| yellow-billed spoonbill | *Platalea flavipes* |
| royal spoonbill | *Platalea regia* |
| crimson rosella | *Platycercus elegans* |
| eastern rosella | *Platycercus eximius* |
| glossy ibis | *Plegadis falcinellus* |
| Pacific golden plover | *Pluvialis fulva* |
| grey plover | *Pluvialis squatarola* |
| tawny frogmouth | *Podargus strigoides* |
| great crested grebe | *Podiceps cristatus* |
| hoary-headed grebe | *Poliocephalus poliocephalus* |
| purple swamphen | *Porphyrio porphyrio* |
| Australian spotted crake | *Porzana fluminea* |
| spotless crake | *Porzana tabuensis* |
| eastern whipbird | *Psophodes olivaceus* |
| great-winged petrel | *Pterodroma macroptera* |
| fluttering shearwater | *Puffinus gavia* |
| red-necked avocet | *Recurvirostra novaehollandiae* |
| grey fantail | *Rhipidura albiscarpa* |
| willie wagtail | *Rhipidura leucophrys* |
| rufous fantail | *Rhipidura rufifrons* |
| white-browed scrubwren | *Sericornis frontalis* |
| beautiful firetail | *Stagonopleura bella* |
| great skua | *Stercorarius skua* |
| common tern | *Sterna hirundo* |
| white-fronted tern | *Sterna striata* |
| little tern | *Sternula albifrons* |
| fairy tern | *Sternula nereis* |
| southern emu-wren | *Stipiturus malachurus* |
| pied currawong | *Strepera graculina* |
| grey currawong | *Strepera versicolor* |
| spotted turtle-dove | *Streptopelia chinensis* |
| common starling | *Sturnus vulgaris* |
| Australasian grebe | *Tachybaptus novaehollandiae* |
| Australian shelduck | *Tadorna tadornoides* |
| crested tern | *Thalaseus bergii* |
| black-browed albatross | *Thalassarche melanophris* |
| hooded plover | *Thinornis rubricollis* |
| Australian white ibis | *Threskiornis molucca* |
| straw-necked ibis | *Threskiornis spinicollis* |
| sacred kingfisher | *Todiramphus sanctus* |
| rainbow lorikeet | *Trichoglossus haematodus* |
| wood sandpiper | *Tringia glareola* |
| common greenshank | *Tringa nebularia* |
| marsh sandpiper | *Tringa stagnatilis* |
| common blackbird | *Turdus merula* |
| painted button-quail | *Turnix varia* |
| Pacific barn owl | *Tyto javanica* |
| masked lapwing | *Vanellus miles* |
| banded lapwing | *Vanellus tricolor* |
| terek sandpiper | *Xenus cinereus* |
| bassian thrush | *Zoothera lunulata* |
| silvereye | *Zosterops lateralis* |

**Waterbird List**

| **Common Name** | **Latin Name** |
| --- | --- |
| common sandpiper | *Actitis hypoleucos* |
| chestnut teal | *Anas castanea* |
| grey teal | *Anas gracilis* |
| Australasian shoveler | *Anas rhynchotis* |
| Pacific black duck | *Anas superciliosa* |
| Australasian darter | *Anhinga novaehollandiae* |
| cattle egret | *Ardea ibis* |
| intermediate egret | *Ardea intermedia* |
| eastern great egret | *Ardea modesta* |
| white-necked heron | *Ardea Pacifica* |
| short-tailed shearwater | *Ardenna tenuirostris* |
| ruddy turnstone | *Arenaria interpres* |
| hardhead | *Aythya australis* |
| musk duck | *Biziura lobata* |
| sharp-tailed sandpiper | *Calidris acuminata* |
| sanderling | *Calidris alba* |
| red knot | *Calidris canutus* |
| curlew sandpiper | *Calidris ferruginea* |
| pectoral sandpiper | *calidris melanotos* |
| red-necked stint | *Calidris ruficollis* |
| great knot | *Calidris tenuirostris* |
| Cape Barren goose | *Cereopsis novaehollandiae* |
| double-banded plover | *Charadrius bicinctus* |
| greater sand plover | *Charadrius leschenaultii* |
| lesser sand plover | *Charadrius mongolus* |
| red-capped plover | *Charadrius ruficapillus* |
| whiskered tern | *Chlidonias hybridus* |
| white-winged black tern | *Chlidonias leucopterus* |
| Australian wood duck | *Chenonetta jubata* |
| silver gull | *Chroicocephalus novaehollandiae* |
| banded stilt | *Cladorhynchus leucocephalus* |
| black swan | *Cygnus atratus* |
| little egret | *Egretta garzetta* |
| white-faced heron | *Egretta novaehollandiae* |
| black-fronted dotterel | *Elseyornis melanops* |
| red-kneed dotterel | *Erythrogonys cinctus* |
| little penguin | *Eudyptula minor* |
| Eurasian coot | *Fulica atra* |
| oriental pratincole | *Glarecola maldivarum* |
| Latham's snipe | *Gallinago hardwickii* |
| dusky moorhen | *Gallinula tenebrosa* |
| black-tailed native-hen | *Gallinula ventralis* |
| buff-banded rail | *Gallirallus philippensis* |
| gull-billed tern | *Gelochelidon nilotica* |
| sooty oystercatcher | *Haematopus fuliginosus* |
| pied oystercatcher | *Haematopus longirostris* |
| grey-tailed tattler | *Heteroscelus brevipes* |
| black-winged stilt | *Himantopus himantopus* |
| Caspian tern | *Hydroprogne caspia* |
| kelp gull | *Larus dominicanus* |
| Pacific gull | *Larus Pacificus Pacificus* |
| Lewin's rail | *Lewinia pectoralis* |
| bar-tailed godwit | *Limosa lapponica* |
| black-tailed godwit | *Limosa limosa* |
| pink-eared duck | *Malacorhynchus membranaceus* |
| little pied cormorant | *Microcarbo melanoleucos* |
| Australasian gannet | *Morus serrator* |
| eastern curlew | *Numenius madagascariensis* |
| whimbrel | *Numenius phaeopus* |
| nankeen night heron | *Nycticorax caledonicus* |
| blue-billed duck | *Oxyura australis* |
| Australian pelican | *Pelecanus conspicillatus* |
| great cormorant | *Phalacrocorax carbo* |
| black-faced cormorant | *Phalacrocorax fuscescens* |
| little black cormorant | *Phalacrocorax sulcirostris* |
| pied cormorant | *Phalacrocorax varius* |
| yellow-billed spoonbill | *Platalea flavipes* |
| royal spoonbill | *Platalea regia* |
| glossy ibis | *Plegadis falcinellus* |
| Pacific golden plover | *Pluvialis fulva* |
| grey plover | *Pluvialis squatarola* |
| great crested grebe | *Podiceps cristatus* |
| hoary-headed grebe | *Poliocephalus poliocephalus* |
| purple swamphen | *Porphyrio porphyrio* |
| Australian spotted crake | *Porzana fluminea* |
| spotless crake | *Porzana tabuensis* |
| red-necked avocet | *Recurvirostra novaehollandiae* |
| common tern | *Sterna hirundo* |
| white-fronted tern | *Sterna striata* |
| little tern | *Sternula albifrons* |
| fairy tern | *Sternula nereis* |
| Australasian grebe | *Tachybaptus novaehollandiae* |
| Australian shelduck | *Tadorna tadornoides* |
| crested tern | *Thalaseus bergii* |
| hooded plover | *Thinornis rubricollis* |
| Australian white ibis | *Threskiornis molucca* |
| straw-necked ibis | *Threskiornis spinicollis* |
| wood sandpiper | *Tringia glareola* |
| common greenshank | *Tringa nebularia* |
| marsh sandpiper | *Tringa stagnatilis* |
| masked lapwing | *Vanellus miles* |
| banded lapwing | *Vanellus tricolor* |
| Terek sandpiper | *Xenus cinereus* |

Bird Count Data Analysis

**Approach**

Three data-sets were avialable for review in this study:

* DSE Fauna database records outlined in the file titled “fauna100\_cornerinlet\_ramsar\_dd94”. This database has count data for fauna species recorded at stations within the Corner Inlet Ramsar site;
* Birds Australia database records (summary only), as outlined in the file titled “BA\_shorebird\_count\_areas\_aust”. This database has a total count of various bird species recorded at stations located throughout Australia. Times are pooled, so temporal trends can not be determined from the data.
* Birds Australia Altas data. The Atlas contains species records at monitoring locations in the Ramsar site. These data show number of records (not always counts) at each sampling station at various times. Data were provided for the New Atlas (1999-2008) and Old Atlas (1977-1984).

The Shorebird Habitat Mapping Project for West Gippsland (Clemens et al. 2007) provides a comprehensive description of trends in waterbird abundance in Corner Inlet based on Birds Australia count data. Clemens *et al*. (2007) also contained a larger data-set than supplied to the study team for this project. Readers should refer to Clemens et al. (2007) for a description of trends in shorebird abundance based on the Birds Australia data.

The analysis below is based on bird count data from the DSE database. A range of indicator species were selected for the assesment, as follows: black swan, grey teal, chestnut teal, pied oyster catcher, curlew sand piper, red-necked stint, bar-tailed godwit, eastern curlew, sooty oystercatcher and double-banded plover.

These species were selected on the basis that they (i) meet the one per cent of the total population criterion (see nomiation criteria 6); and/or (ii) are species that utilise the range of freshwater and coastal types found within the site; and/or (iii) are sensitive to changes associated with some key threats (for example, pied oyster catcher is sensitive to disturbance by humans and foxes); and/or (iv) were identified in Ecos (unpublished) as having a decline in abundance within the site. Note that other species are also identified as meeting the one per cent population criterion at the site, but data for these species were extremely limited and were therefore excluded from analyses.

For each species, the following was derived:

* plots of the maximum and average numbers of individuals recorded in each year (stations pooled). Note the average number of individuals is defined as the average number of individuals counted at a monitoring station at different sampling occasions within a year. This count is not standardised and there is great variability in numbers of stations sampled within and among years.
* descriptive statistics for count data for each year (shows number of records/episodes (not counts) per year), as well as average abundance per year (stations pooled) (Tables D1 to D15). The first column in these summary tables is the year of the surveys. Within each year, the mean (and standard deviation and standard error) number of birds recorded on each survey occasion was calculated. The “Count” column is the number of survey occasions within each year in which the species was recorded (equivalent to reporting rate). The minimum and maximum values are the lowest and highest number of birds recorded in each year.

**Key Trends**

Figure D1 and D3 shows that there was great year to year variability in counts of the key waterbird species black swan, grey teal and chestnut teal. Based on summary statistics presented in Tables A to C and Figure D1:

* maximum and average annual counts were higher in the period pre-1993 than after this period. In particular, the period 1985 to 1993 had high numbers of all three species.
* the reporting rate (that is the number of sampling sites and episodes per year; the “Count” column), which is a coarse measure of sampling effort, was lower in the post-1992 period for these species. This suggests that ‘changes’ over time for these species were at least partly a response to differences in sampling effort.
* there was no clear association between annual flows from the Tarra River at Yarram (ML/day) and average bird counts.



**Figure D1 Maximum Annual Count of Black Swan, Chestnut Teal and Grey Teal Based on DSE (unpublished) Fauna Database Records. Average Annual Flow (ML/day) from the Tarra River at Yarram Monitoring Station (Source: Victorian Water Resources Data Warehouse) are Superimposed**

Figure D2 shows the maximum annual count of selected marine shorebird species. Similar to trends for black swan and the two species of teal, counts were highly variable over time, with highest counts occurring in the period between 1985 and the early 1990’s.

It is important to note the following when interpreting data:

* A variety of sampling methods have been used with varying levels of sampling effort applied;
* There are no metadata describing sampling effort at each station over time;
* Over time, there has been a change in species targeted in surveys. For example, there has been greater scientific interest and therefore survey effort given to Fairy Tern. While counts of this species have been higher in recent years compared to prior to listing, it is likely that this could relate to differnces in sampling effort over time.
* Therefore, data cannot be scaled as counts per unit effort in its existing format.

For these reasons, it is not possible to derive empirical indices describing changes in bird abundance over time or among stations based on DSE data. Systematic sampling using standardised count methods would be required to develop appropriate bird abundance metrics.



**Figure D2 Maximum Annual Count of Selected Marine Shorebird Species** **Based on DSE (unpublished) Fauna Database Records**



**Figure D3 Average Bird Count (Per Sampling Occasion Per Station) for the Years 1977 to 2005, Based on DSE (unpublished) Fauna Database Records. Average Annual Flow (ML/day) from the Tarra River at Yarram Monitoring Station (Source: Victorian Water Resources Data Warehouse) are Superimposed**

**Table D1 – Summary Statistics for Black Swan Based on DSE Bird Count Data**



**Table D2 – Summary Statistics for Grey Teal Based on DSE Bird Count Data**



**Table D3 – Summary Statistics for Chestnut Teal Based on DSE Bird Count Data**



**Table D4 – Summary Statistics for Pied Oyster Catcher Based on DSE Bird Count Data**



**Table D5 – Summary Statistics for Fairy Tern Based on DSE Bird Count Data**



**Table D6 – Summary Statistics for Hooded Plover Based on DSE Bird Count Data**



**Table D7 – Summary Statistics for Caspian Tern Based on DSE Bird Count Data**



**Table D8 – Summary statistics for Crested Tern based on DSE Bird Count Data**



**Table D9 – Summary Statistics for Curlew sandpiper Based on DSE Bird Count Data**



**Table D10 – Summary Statistics for Red-necked Stint Based on DSE Bird Count Data**



**Table D11 – Summary Statistics for Bar-tailed Godwit Based on DSE Bird Count Data**



**Table D12 – Summary Statistics for Eastern Curlew Based on DSE Bird Count Data**



**Table D13 – Summary Statistics for Sooty Oyster-catcher Based on DSE Bird Count Data**



**Table D14 – Summary Statistics for Double-banded Plover Based on DSE Bird Count Data**



**Table D15 – Summary Statistics for Pacific Gull Based on DSE Bird Count Data**

