Index of Wetland Condition Assessment Procedure

August 2022

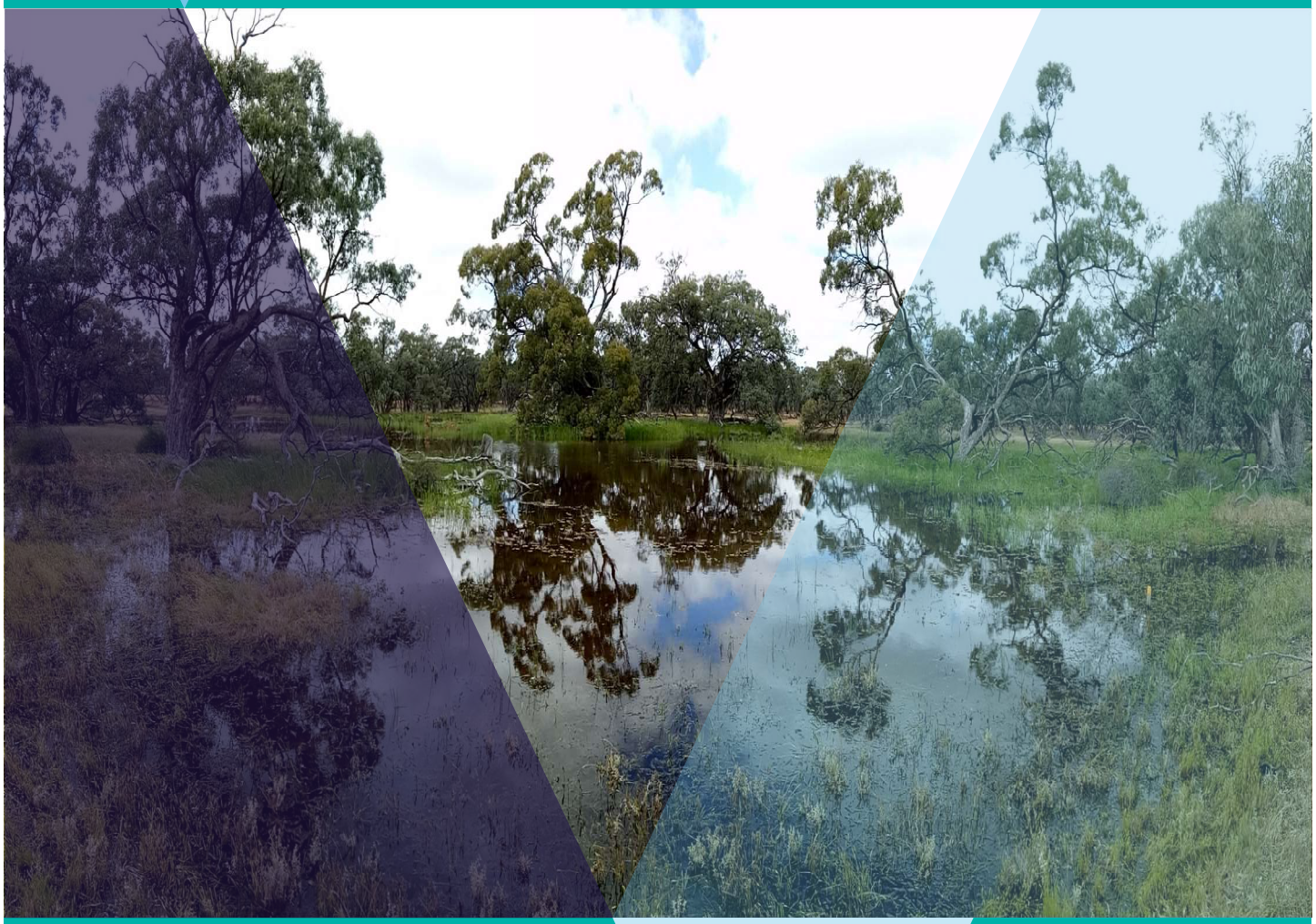

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Photo credit

Carapugna Wetland in the Wimmera region of Victoria. Photo: DELWP.

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Acronyms and Glossary

Acronyms

AGD66: Australian Geodetic Datum. The least squares adjustment of the Australian geodetic network performed in March 1966 used the Australian Geodetic Datum. This adjustment produced a set of coordinates which, in the form of latitudes and longitudes, is known as the Australian Geodetic Datum 1966 coordinate set (AGD66). This has now been replaced by the Geocentric Datum of Australia (GDA).

EVC: Ecological Vegetation Class. EVCs are a type of native vegetation classification described through a combination of floristics, life forms and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC can include a collection of floristic communities that occur across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating (Woodgate et al. 1994).

GDA: Geocentric Datum of Australia is a contemporary approach to modelling the earth's surface. It provides a single international standard for data collection, analysis and storage. It supersedes previously used regional models, with a more accurate and standardised approach to defining the earth's surface. A datum is a mathematical model that represents the shape of the earth. GDA is a geocentric (earth-centred) datum that models the earth's shape as a whole. This is different to previous datums, which modelled a localised area (region or country) of the earth.

MGA: Map Grid of Australia. The MGA coordinate system is a Universal Transverse Mercator projection projected from GDA94 geographical coordinates. It replaces the AGD66 (Australian Grid Datum 1966) coordinate system, which is also a Universal Transverse Mercator projection, but based on the superseded AGD66 datum.

VBA: Victorian Biodiversity Atlas. A database of Victorian aquatic and terrestrial biota. (https://vba.dse.vic.gov.au)

Glossary

Bathymetry: Underwater topography defined by patterns in depth.

Mumbling: Feeding behaviour of carp that involves sucking in sediment and expelling the inedible sediment through the gill openings. This often leaves depressions in the substratum (see Plate 6).

Wetland buffer: The native vegetation adjacent to the wetland (from the maximum inundation level outwards). Consider the following:

- For the purposes of the IWC buffer measure, native vegetation is defined as vegetation where the overstorey (if present) is predominantly native, and native species make up more than 25% of the total understorey cover.
- Areas of revegetation are classed as native vegetation if they simulate the natural EVC and meet the above criteria.

Wetland EVC: An EVC is regarded as relevant to wetlands if the ecological effects of at least intermittent inundation or extreme waterlogging are expressed in the floristic composition. This determination has been based on the ecological attributes and habitat preferences of the component species. Presently, 158 wetland EVCs have been described (DELWP 2022a).

Wetland landscape profile: Wetland landscape profiles are descriptions and diagrams of landscape types that can assist with the determination of wetland Ecological Vegetation Classes for wetland vegetation assessment (see DELWP 2022a for more information on wetland vegetation assessment). The wetland landscapes covered in each profile are based on environmental attributes, including altitude, geomorphology and, to varying extents, geographical position in the state. Each profile diagram indicates a range of wetland landscape components within which wetland habitat may occur. Landscape profiles are provided in Appendix 2

Wetland landscape component: The Landscape components indicate habitats within a given landscape that can support wetlands. A short list of the EVCs that can potentially be present within a specific

component is provided as an aid to identifying the relevant EVCs occurring at specific sites. The components are largely characterised by position in the landscape and by hydro-geomorphology, both of which have a strong bearing of the range of plant species and EVCs that can be represented. This supporting information is included in DELWP (2022a). Wetland landscape components are contained in the wetland landscape profiles in Appendix 2.

Wetland phase: The hydrologic state of the wetland with respect to flooding. Wetland phases documented in the IWC assessment are: full, filling, drying and dry.

VICNAMES: The Victorian register of geographic place names. Its URL is http://maps.land.vic.gov.au/lassi/VicnamesUI.jsp

Vicgrid94: is a Victorian specific coordinate system used for Statewide mapping and spatial analysis. It is a Lambert Conformal Conic projection, which provides a single-zone grid coverage across the state. The original Vicgrid(66) coordinate system (which was referenced to the AGD datum) has now been superseded by Vicgrid94 (which is referenced to the GDA).

Victorian Wetland Inventory (Current): Spatial coverage of current wetlands in Victoria (DELWP 2018a). This inventory is called Current Wetlands in the IWC Mapping Tool and will be referred to as this throughout the IWC Assessment Procedure.

Victorian Wetland Inventory (Pre European): Spatial coverage of wetlands in Victoria at the time of European settlement (DELWP 2018b). This inventory is called Pre European Wetlands in the IWC Mapping Tool and will be referred to as this throughout the IWC Assessment Procedure.

IWC assessment procedure support and feedback

Email: IWC.support@delwp.vic.gov.au

IWC Field Assessment Tool

A field data collection and entry tool is available at https://iwc.vic.gov.au/miwc/. This should be used in conjunction with the IWC Assessment Procedure.

1 Background

1.1 Document purpose

This document provides guidelines for applying the Index of Wetland Condition (IWC) assessment procedure. The IWC assessment procedure is used to assess the condition of Victoria's wetlands and assist in management decisions. Other condition indices used in Victoria include Habitat Hectares and The Index of Stream Condition, which are used to assess the condition of Victoria's native vegetation and rivers, respectively.

This document explains the steps needed to assess wetland condition both prior to the wetland visit and at the wetland. An overview of the IWC structure and scoring system is also provided. Field assessment sheets for data collection are included in Appendix 3.

Several other documents provide context for the IWC, its scoring system, and its quality assurance and quality control system for the wetland vegetation assessment component. These are:

- Index of Wetland Condition Conceptual Framework and Selection of Measures (DSE 2005). This describes in detail the framework that underpins the development of the IWC and the selection of measures.
- Index of Wetland Condition Training, information management and testing (DSE 2009). This outlines the training program in the use of the IWC, development of information management protocols and databases and the testing of the IWC for consistency in measuring condition against a number of criteria.
- Index of Wetland Condition: Assessment of Wetland Vegetation – August 2022 (DELWP 2022a). This outlines the approach to the assessment of wetland vegetation quality.
- An assessment of quality assurance and quality control measures for the Index of Wetland Condition (Papas and Morris 2014). This outlines the quality control and quality assurance plan for the IWC.

These documents are available on the resources page of the Index of Wetland Condition Data Management System (IWCDMS) website https://iwc.vic.gov.au/resources.

1.2 Status of the Index of Wetland Condition assessment procedure document

The following changes have been made in this version of the document as follows:

- URL for the IWC Field Assessment Tool added
- URL for the IWC Data Management System and IWC mapping tool updated
- URL for IWC resources updated
- formatting updated to align with current DELWP style
- formatting improvements made to the field sheets and minor typographic errors corrected

1.3 Who should use this document?

The IWC Assessment Procedure is designed for use by a person assessing wetland condition using the IWC method. This will usually be a natural resource management (NRM) practitioner or environmental consultant with general expertise in NRM, some skills in wetland ecology, and botanic expertise. Specific agencies likely to use the IWC and the IWC Assessment Procedure are Catchment Management Authorities (CMAs), Parks Victoria, Department of Environment, Land, Water and Planning, water authorities, local government, environmental consultants and wetland scientists.

1.4 Quality assurance and quality control system

The IWC is the principal method used for assessing the condition of Victoria's wetlands. It forms the basis for prioritisation of wetlands in Victoria's Waterway Management Program and assists in management decisions. These purposes require high quality, consistent IWC data. Confidence in the quality and

consistency of IWC data requires the implementation and maintenance of a quality assurance system incorporating quality assurance (QA) and quality control (QC) measures. QA refers to the processes that are used to assure the quality of a product or service during its production or development. QC refers to activities designed to evaluate the quality of a product or service. A range of procedures, activities, products and recommendations have been developed within the IWC program to assure and test IWC data quality and consistency. In general, the costs of meeting the QAQC requirements for the IWC will need to be met from within the assessment program.

Quality assurance

QA measures for the IWC program aim to ensure the competence of assessors and the secure and effective management of IWC data.

Assessment teams and assessor competence

The following measures help to assure accurate IWC assessments and that assessors are competent in performing assessments.

- *Number of assessors:* Assessments should be performed by two trained assessors wherever possible. Assessments can be performed by one staff member only if all of the following requirements are met:
    1. The assessor is trained in the IWC assessment procedure.
    2. The assessor has the botanical skills detailed in Table 1 (page 7).
    3. OH&S risks of there being only one assessor in the field have been adequately controlled.
- *Mandatory training*: All IWC assessors must have completed an IWC training program provided by DELWP in the last 5 years. Assessors must also have performed IWC assessments within 1 year of training, and at least every 2 years thereafter. If these requirements are not met, an IWC training course must be completed. At present, training is provided only to CMAs undertaking IWC assessments (and to the consultants they engage).
- *Required wetland vegetation assessment skill*: The wetland vegetation assessment component of the IWC requires some specialist skill in wetland plant identification. To complete this component of the IWC, assessors must be trained in the IWC assessment procedure and must also have the botanical skills detailed in Table 1 (page 7). Where two trained assessors undertake an assessment, only one assessor is required to have the specified plant identification skills.
- *Supporting materials and resources:* To assist assessors in performing assessments, a range of up-to-date material and resources are available on the resources page of the IWCDMS website http://iwc.vic.gov.au/resources. These include the IWC Assessment Procedure (this document), the EVC field guide, the vegetation assessment report and the link to the IWC wetland mapping tool. In addition, guidance in performing assessments can be sought from the IWC support team by email: IWC.support@delwp.vic.gov.au

Table 1: Botanic skills required for the vegetation assessment component of the IWC (modified from the Vegetation Quality Assessment procedure, DSE 2004).

Ability	Skill level expected of IWC assessors
Recognition of plant species	Can distinguish between all the individual native species present
	Can identify the native species that are required to discriminate between wetland EVCs
	Can identify life forms that are characteristic of wetland EVCs
	Can identify weed species
Recognition of vegetation types	Can identify wetland EVCs, using reference material, and recognise any major floristic community variants that occur within these EVCs
Recognition of condition attributes	Can consistently estimate cover values for life forms and weeds
	Can identify biological invasions due to altered processes

Data management

The Index of Wetland Condition Data Management System (IWCDMS) is a web-based system administered by DELWP to securely enter, store, access and retrieve IWC data (including annotated maps and photo point images). It is located at the following URL: https://iwc.vic.gov.au. The system includes features designed to minimise user error and automate IWC score calculations. To reduce the risk that assessment data is lost or that incorrect or incomplete data is entered, assessors must enter data for field assessment sheets and upload annotated maps and photo point images onto the IWCDMS within 4 weeks of data collection. Hard copies of field assessment sheets and annotated maps must be kept for a minimum of 5 years by the organisation in charge of the project and made available for auditing purposes upon request.

Quality control

IWC QC measures test the standard of IWC assessments and promote continuous improvement by monitoring the level of satisfaction experienced by users of the IWC method.

Quality of IWC assessments

Desktop and field-based audits will be done by DELWP as outlined below to assess the quality of IWC data. Desktop audits assess the completeness and accuracy of data entries on field assessment sheets and the IWCDMS, as far as is possible without a site visit. Field visits assess the accuracy of data collection in the field.

IWC projects with more than 20 IWC assessments should be audited by DELWP. A greater number of audits may be required for projects where a higher level of confidence is required. A desktop and field audit should be performed:

- Desktop audits should be performed on 10% of randomly selected IWC assessments. Desktop audits should include a detailed check of field assessment sheets and corresponding IWCDMS data for omissions and errors.
- Field-based audits should be performed on at least 5% of IWC assessments per project. Field audits require the wetland to be reassessed by the IWC team or an experienced independent assessor.
- Assessments should be randomly selected for auditing; however, where desktop audits have identified a sufficient number of errors that relate to data collected in the field, a field audit should be performed.

Errors identified in audits should be documented, discussed with assessors and corrected. A level of confidence in the quality of data will be assigned based on the type and number of errors found. Audit results should be used to inform improvements in the methods, resources and/or training in order to reduce further errors where possible. Audit data must be provided to DELWP upon request. Further details on confidence levels are contained in Papas and Morris (2014).

Stakeholder expectations

The following measures are to monitor and evaluate the effectiveness of the IWC method, training and data management systems:

- provision of stakeholder issues and feedback lodged through the IWCDMS or emailed (IWC.support@delwp.vic.gov.au)
- evaluation workshops for obtaining stakeholder feedback (5-yearly)
- formal evaluation and review of the IWC materials, resources and method (5-yearly).

Summary of QAQC requirements of agencies assessing wetlands using the IWC

1. Skills and training

All IWC assessors must have completed the IWC training program provided by DELWP in the last 5 years. Assessors must also have performed IWC assessments within 1 year of training, and at least every 2 years thereafter. If these requirements are not met, an IWC training course must be completed. To complete the plant assessment component of the IWC, assessors must also have the specified botanical skills (Table 1). Where two trained assessors undertake an assessment, only one needs to have the required plant identification skills.

2. Auditing assessments

Agencies undertaking IWC programs involving more than 20 wetland assessments must undergo a DELWP audits of 10% of assessments, and field-based audits on 5% of assessments. Assessments should be randomly selected for auditing; however, where desktop audits have identified errors, field audit should be performed.

3. Data management

IWC assessors must enter assessment data and upload annotated base maps and photo point images onto the IWCDMS within 4 weeks of completing an assessment. All assessment sheets, annotated base maps and photo point images must be stored for a minimum of five years.

1.5 How the IWC should be used

The IWC will be useful in any program in Victoria where knowledge of wetland condition is important for the management of wetlands. The IWC is a tool for NRM agencies that manage wetlands to assist them with implementation of the assets-based approach to NRM, as outlined in 'Index of Wetland Condition Conceptual Framework and Selection of Measures' (DSE 2005). Specifically, the IWC will assist with:

- assessing the condition of wetlands and setting resource condition targets
- prioritising wetlands for which management actions are required
- identifying wetlands where threats are operating
- assisting with the evaluation of management interventions by comparing the relative effectiveness of different interventions in improving condition
- evaluating management effectiveness against resource condition targets
- reporting on wetland condition.

Condition measurement is only one of the tools that can be used for the overall assessment and management of wetlands (DSE 2005). Other considerations in managing wetlands are wetland values (environmental, social, cultural and economic), threats to wetlands, feasibility and cost of management options, community support for action, and availability of knowledge for implementing management options.

1.6 Wetlands that can be assessed using the IWC

The IWC has been designed to assess the condition of naturally occurring wetlands with static (or very slow-flowing) water and without marine hydrological influence or only a minor one (DSE 2005). It is not designed to be used for flowing waters (rivers and streams), artificial wetlands, or marine and estuarine habitats.

However, wetlands that have a connection with tidal lakes or estuaries, such as those fringing the Gippsland Lakes and the Snowy River Estuary, can be assessed using the IWC.

A full IWC assessment requires information about the extent of a wetland at the time of European settlement. It will not be possible to undertake the full IWC assessment for natural wetlands where the pre-European extent of the wetland is not known. DELWP has developed a statewide geospatial layer that estimates the extent of wetlands greater than one hectare (ha) in size at the time of European settlement (Pre European Wetlands). Some smaller wetlands are not mapped on this layer. For such wetlands, the wetland boundary at the time of European settlement must be determined and mapped in order to use the IWC. This exercise is not within the scope of the IWC assessment and is not described in this document. Mapping will require specialist knowledge, and professional advice should be sought.

Extreme dry conditions

Where wetlands have been dry for extended periods (over several years for example), there may be a significant reduction in the abundance and cover of wetland plants. In the event that wetland plants are very scarce or absent due to drought, this should be documented, and the wetland vegetation (biota sub-index) should not be assessed. Other measures should be assessed, however.

1.7 Selecting the wetland to assess

The wetlands to be assessed using the IWC will be selected by a NRM agency or wetland manager. The IWC Assessment Procedure does not provide guidance on how to select wetlands for condition assessment. However, because the IWC involves on-site assessment, there are some practical issues to be considered when selecting a wetland for assessment, as follows:

- ensuring the appropriate land manager is consulted and permission has been granted to access the wetland
- determining whether there are likely to be privacy issues with the use of the data collected in the assessment (this may be the case with wetlands on private land)
- determining whether there is safe physical access to the wetland (e.g. vehicle access or reasonable access on foot).

If permission cannot be obtained or there is no physical access to the wetland, it will not be possible to undertake an IWC assessment.

1.8 Collecting additional data

Where there is notable flora and/or fauna present at an IWC assessment site, the assessor is encouraged to keep a record of the species observed. A template for documenting notable species is included in the field assessment sheets and on the wetland base maps.

It is recommended that the assessor enters flora and fauna species details onto the Victorian Biodiversity Atlas, which can be accessed at https://vba.dse.vic.gov.au

2 Overview of the IWC

2.1 IWC structure and measures

The IWC has six sub-indices: Wetland Catchment, Physical Form, Hydrology, Water Properties, Soils, and Biota. Each sub-index has one or more measures of the ecological components relevant to that sub-index. Measures are based on the ecological component, or potential impacts or threatening activities to the component (Table 2).

Table 2: Sub-indices, components and measures used in the IWC (adapted from DSE 2005).

IWC sub-index	Key ecological component	Measure	Measure type
Wetland catchment	Wetland catchment	Land-use intensity adjacent to the wetland	Threat
	Wetland buffer	Average width of the buffer	Component
		Percentage of wetland perimeter with a buffer	Component
Physical form	Area of the wetland	Percentage reduction in effective wetland area	Component
	Wetland form	Percentage of wetland where activities have resulted in a change in bathymetry	Threat
Hydrology	Water regime	Severity of change to the water regime expected from activities identified as altering the water regime	Threat
Water properties	Nutrients	Severity of nutrient enrichment	Threat
	Salinity	Severity of change in salinity	Threat
Soils	Soil physical properties	Severity and extent of wetland soil disturbance	Impact
Biota	Wetland plants	Critical life forms	Component
		Presence of weeds	Impact
		Indicators of altered processes	Impact
		Vegetation structure and health	Component

Wetland catchment

The wetland's catchment is defined by its geomorphic setting and the water source for the wetland. Clearing of native vegetation and many land uses within the wetland catchment may lead to changes in surface water flows, groundwater levels, and levels of nutrients, sediments and pollutants entering the wetland. Native vegetation adjacent to the wetland (the wetland buffer) plays an important role in ameliorating these impacts. It also provides protection from disturbance to wetland fauna.

The IWC includes a threat-based measure of land-use intensity adjacent to the wetland and two measures of the wetland buffer: average width, and the percentage of the wetland perimeter with a buffer.

Physical form

A wetland's physical form influences the flooding depth, duration of inundation, and the mixing regime of the wetland. It also influences biological components and physical processes. The area of the wetland determines the amount and proportion of available habitat for biota. The bathymetry (topography) of a wetland is a determinant of the biotic habitats present in a wetland.

The principal threats to physical form are a reduction in wetland area (when wetlands or part thereof are effectively converted to dry land, e.g. by infilling or draining) and excavation or landforming of the wetland bed. The impacts on the wetland include loss of habitat, changes in habitat, and changes in depth.

The IWC includes measures for a reduction in the area of the wetland, and for the percentage of the wetland where activities have resulted in a change in bathymetry.

Hydrology

Wetland hydrology drives many wetland processes. The wetland water regime is the frequency, duration and timing of inundation. The frequency of inundation refers to the average number of times a wetland is filled in a given period of time. Duration is the length of time surface water is present. Timing refers to time of year (season) in which inundation typically occurs.

Threats to the water regime of the wetland are activities that change the flow regime of the wetland water source, activities that interfere with the natural connectivity of flow to and from the wetland, disposal of water into the wetland, extraction of water directly from the wetland, or activities that change the natural depth of the wetland. Changes in hydrology can be expressed as changes to one or more elements of the water regime.

The IWC includes a threat-based measure for hydrology: the severity of change to the water regime expected from activities identified as altering the water regime.

Water properties

The water properties influence many of the biotic components of wetlands and their processes (e.g. feeding, growth and reproduction of fauna, and growth of flora). Water properties are either physical or chemical. Physical properties include temperature, turbidity and suspended solids. Chemical properties include macronutrients, micronutrients, cations, anions, metals, silicon, colour, dissolved gases, electrical conductivity, alkalinity, pH, redox potential and dissolved organic carbon. The IWC includes threat measures for nutrients and salinity. Measures for other components of water properties are not included, because potential measures did not meet the requirements of the IWC (DSE 2005).

Threats that can lead to an increase in nutrients include clearing and activities such as grazing by livestock or feral animals, and aquaculture. Increased nutrients in the wetland can lead to changes in primary productivity and subsequent changes in food webs. Secondary salinisation of wetlands can be caused by catchment clearing and poor irrigation practices, which raise water tables and mobilise salts in the soil. Wetland secondary salinisation can lead to changes in wetland biota abundance, diversity and richness, increases in water clarity and, potentially, salinity stratification of the water column. Naturally saline wetlands can also become fresh from unnatural freshwater inputs (e.g. irrigation).

The IWC includes two threat-based measures for water properties: severity of nutrient enrichment and severity of a change in salinity.

Soils

Wetland soils provide a physical substrate for aquatic plants (including macrophytes and algae), and habitat for benthic invertebrates and microorganisms. They store nutrients that are important for primary production, bind toxicants such as heavy metals, provide a site for many chemical transformations and enable nutrient cycling.

Soils have physical, chemical and biological components. Physical components include the soil structure, texture and consistency. Chemical components include the soil's redox potential, salinity, acidity, dissolved organic carbon, nutrients, trace elements, etc. The biological components of soils are its biota and include microorganisms, invertebrates, fungi and plants. The IWC includes an impact measure (soil disturbance) relating to the soil's physical components. Measures are not included for the soil chemical and biological components because potential measures did not meet the requirements of the IWC (DSE 2005).

Threats to the physical properties of wetland soils are activities such as pugging by livestock and feral animals, human trampling, driving of vehicles in the wetland, and carp mumbling. These activities cause soil disturbance, which can reduce the water storage capacity of the soil, have negative impacts on some invertebrates, and increase turbidity during filling.

The IWC includes a measure for the severity and extent of physical soil disturbance.

Biota

Wetland biota depends on wetlands for all or part of their life cycle. Wetland biota includes phytoplankton, wetland plants (e.g. herbs, ferns, shrubs and trees), aquatic invertebrates, vertebrates (e.g. fish, amphibians, birds, mammals and reptiles) and microorganisms (e.g. fungi, diatoms and microbes). The types and abundance of biota present in a wetland are strongly influenced by its hydrology and physico-chemical environment. Wetland biota are characterised by their tolerance and/or dependence on flooding. Wetland biota can also influence other wetland components and processes, such as nutrient and energy cycling.

All the threats that lead to changes in hydrology (changes in the water properties of the wetland) can affect the biota as well as leading to physical loss of wetland habitat or changes to habitat. In addition, there may be direct threats to biota, such as clearing of native wetland vegetation, or the introduction of invasive species.

Impacts on biota include changes in wetland productivity, altered flora and fauna community assemblages, and a loss or reduction in fauna habitat. The IWC includes a measure for the assessment of wetland vegetation quality. Measures for other biota components are not included because potential measures did not meet the requirements of the IWC (DSE 2005).

The IWC includes four measures of wetland vegetation condition.

2.2 IWC scoring and reporting

The total IWC score for a wetland is calculated by summing each sub-index score multiplied by its respective weight (Table 3). This can be represented by the following formula:

$$\mathrm{IWC}_{\mathrm{total}} = \sum_{i=1}^{6} (w_i \times s_i)$$

where $\mathrm{IWC}_{\mathrm{total}}$ is the total IWC score, s_i is the sub-index score and w_i is the weight of the corresponding sub-index (Table 4).

Score calculation

The IWCDMS automatically calculates the sub-index scores and the IWC total score, and assigns condition categories based on these scores.

Table 3: Weights for each sub-index (DSE 2009).

IWC sub-index	Weight
Biota	0.190
Wetland catchment	0.068
Water properties	0.122
Hydrology	0.081
Physical form	0.021
Soils	0.018

Each sub-index has a maximum score of 20. After the weights are applied, the maximum possible total score is 10. This score should then be rounded to the nearest whole number to determine its wetland condition category (Table 4). Where data is not available for one or more sub-indices (due to prolonged dry conditions, for example), no total score should be given and the wetland should be assigned the category 'insufficient data'.

Table 4: Wetland condition categories and their respective score ranges.

Sub-index score range (except hydrology and biota)	Hydrology score	Biota sub-index score range	IWC total score range	Wetland condition category
0–5	0	0–8	0–2	Very poor
>5–9	5	>8–13	3–4	Poor
>9–13	10	>13–16	5–6	Moderate
>13–17	15	>16–18	7–8	Good
>17–20	20	>18–20	9–10	Excellent

3 IWC assessment steps

The IWC assessment requires steps prior to and during a visit to the wetland (Figure 1). The steps are described in this section, and information to assist with the assessment is provided.

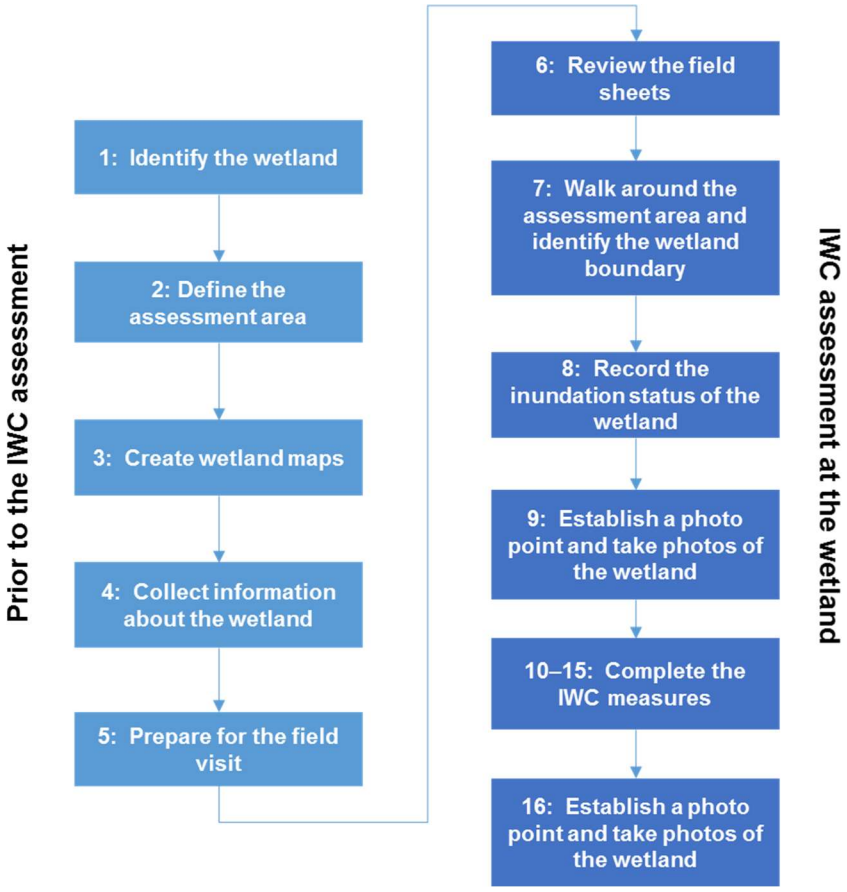

Figure 1: Steps in the IWC assessment procedure.

Step 1: Identify the wetland

The first step is to clearly identify the wetland that has been selected for assessment. Most wetlands in Victoria greater than 1 ha have been mapped and are contained in two DELWP spatial wetland inventories: Pre European Wetlands and Current Wetlands. Wetlands in these inventories have a unique identifier that is a whole number. This identifier will be the primary means of identifying the wetland for future reference. The wetland inventories should be checked to see if the wetland is listed. The IWC wetland mapping tool will assist in determining whether the wetland is on these inventories.

Method 1 – if name and wetland identifier/number are known

1. Navigate to the interactive mapping website at the following URL:

http://mapshare.maps.vic.gov.au/MapShareVic/index.html?viewer=MapShareVic.PublicSite&locale=en-AU

2. In the search field at the top right of the site, type in the wetland name or wetland identifier if known.
3. Select the wetland in the search results on the left hand side of the screen, making sure you select the result that is prefaced by 'Current Wetland', not 'Locality' or some other term.
4. View the wetland details on the left-hand side of the screen.

Method 2 – if the wetland name and number are not known, but its location is known

1. Navigate to the wetland using your mouse to move around, and pan in and out.
2. Click on the wetland.
3. In the text box that appears near the top left of the map, select 'View Additional Details'.
4. View the wetland details on the left-hand side of the screen.

If the wetland is listed, the wetland identifier should be recorded on the first page of the field assessment sheet. If the wetland is not listed in the inventories, the details of the wetland should be entered in the New Wetland field on page 1 of the field assessment sheets.

Wetlands that are not on the DELWP spatial inventories

If a wetland is not on the Current Wetlands spatial inventory, the wetland is considered a new wetland, and the coordinates should be recorded in the New Wetland field on page 1 of the field assessment sheet. The coordinates can be obtained by several means: (1) on site using a GPS, (2) from the IWC wetland mapping tool (http://mapshare.maps.vic.gov.au/MapShareVic/index.html?viewer=MapShareVic.PublicSite&locale=en-AU) or (3) from a spatial or mapping application such as Google Earth (http://www.google.com/earth). The coordinates should be recorded in Vicgrid94 datum (see Glossary) with an Easting and Northing. Where a spatial or mapping application is used, the coordinate of the centre of the wetland should be recorded.

Wetland name

Some wetlands in Victoria have a name, but many more do not. Names of some wetlands are recorded on the wetland spatial inventories and will be shown on the wetland base map (see Step 3), but others may have an official or local name that is not recorded on this layer. If the wetland is named, the name should be recorded on the first page of the field assessment sheet and the origin of the name indicated. The VICNAMES website (http://maps.land.vic.gov.au/lassi/VicnamesUI.jsp) may help to clarify the official name of the site.

Step 2: Define the assessment area

Wetlands vary greatly in size and require different approaches (and different amounts of time) for the assessment. Determining the size of the wetland prior to undertaking an assessment will indicate the appropriate assessment approach and time requirements. The IWC assessment is designed to be completed in 3 hours or less for the majority of wetlands in Victoria. Wetlands in Victoria range in area from 24,380 ha (Lake Corangamite) to less than 1 ha. There is a limit to the size of the wetland area that can be assessed in 3 hours: it is considered to be a wetland that can be walked around in 45 minutes and is approximately 150 ha in area, although factors such as the ease of access around the wetland perimeter will affect the time required to assess the wetland. The time taken to undertake IWC assessments at some wetlands in the Corangamite region is provided as a guide (Table 5). Guidance for assessing wetlands of various sizes is provided below the table.

Table 5: Time taken to complete IWC assessments at wetlands in the Corangamite region.

Wetland size (ha)	Time taken to complete IWC assessment (min)
4	45
5.6	90
18	30
39	90
54	120
220	180

Wetlands less than 150 ha

Ideally, wetlands less than 150 ha should be assessed in their entirety if there is access to the whole wetland. This will apply to the majority of wetlands (greater than 95% of mapped wetlands are less than 150 ha). Indicate that the whole wetland is to be assessed on the first page of the field assessment sheet (Step 2). If access is not possible, refer to the guidance for large discrete wetlands below.

Wetlands greater than 150 ha

For larger wetlands, an assessment of the entire wetland is likely to take longer than 3 hours and may be difficult if access is restricted. Two broad approaches are recommended for assessing large wetlands. One is for large discrete wetlands such as lakes. The other is for large wetlands in floodplain complexes, such as Barmah Forest, where several different large wetlands integrate and are often difficult to access and define on the ground. It is recommended that assessors who plan to use the IWC at a large wetland contact IWC support: IWC.support@delwp.vic.gov.au

Large discrete wetlands

Large discrete wetlands (e.g. Lake Tyrell and Hird Swamp) should be assessed in their entirety if practical, even though this may take longer than 3 hours. As a first step, a recent (less than 5 years old), high-resolution aerial photo of the wetland should be obtained. This can be done through the IWC wetland mapping tool (see Step 3). The aerial photo should be used to initially determine different broad vegetation types (e.g. trees, shrubs, grasses) within the wetland. An assessment should then be made about whether or not at least part of each different type of vegetation is accessible. EVCs will still need to be identified on the ground and sample assessments made within each EVC, even if the whole area of an EVC cannot be covered.

The aerial photo can also be used to identify any areas where part of the wetland may have been converted to dry land, or where the form of the wetland may have been altered (e.g. by excavation or landforming). These areas should be checked on the ground, if possible. The buffer width and adjacent land use should be assessed at numerous points around the wetland, and the aerial photo used to extrapolate results to parts of the wetland perimeter that cannot be visited. Soil disturbance should be assessed at numerous points around the wetland and the results extrapolated, taking into account likely access by livestock or signs of cultivation or vehicle tracks on the aerial photo.

If access permits, indicate that the whole wetland is to be assessed on the first page of the field assessment sheet (Step 2). If access is restricted to the extent that EVCs cannot be sampled and soil disturbance and wetland catchment measures cannot be assessed for large parts of the wetland, an IWC assessment should not be undertaken or confined to a selected reference section of the wetland.

Floodplain wetland complexes

In large floodplain complexes, individual wetlands (contained in the Current Wetlands and Pre European Wetlands spatial inventories) are often large, difficult to access and difficult to define on the ground.

Their boundaries may be complex, and one wetland may adjoin another. To assess such wetlands using the IWC, it is suggested that one or more permanent sampling plots are established in the wetland. The sampling plots should not be larger than 150 ha and should collectively cover the range of variation within the wetland, as determined by vegetation mapping (where available) or as detected from aerial photos. The plots should also be easy to identify on the ground, because they should be used for repeated IWC assessments over time.

The sampling plot should be treated as if it is the whole wetland for the purposes of the IWC field assessment, with wetland catchment measures assessed in the area immediately adjacent to the plot. If sample plots are assessed instead of the entire wetland, this should be indicated at Step 2 of the field assessment sheet. A separate IWC assessment should be made for each sampling plot within the wetland. For each of these, a map should be attached showing the location of the sampling plot and the area and coordinates of the centre of the sampling plot provided.

Step 3: Create wetland maps

Maps for use with the IWC assessment are generated by the IWC wetland mapping tool located at the following URL:
http://mapshare.maps.vic.gov.au/MapShareVic/index.html?viewer=MapShareVic.PublicSite&locale=en-AU

Three types of maps are required for the IWC assessment:

1. **Wetland base maps**: two base maps are required. The first should include annotations of changes to the wetland boundary, areas of soil and bathymetry disturbance, the wetland buffer boundary and activities that alter wetland hydrology (e.g. presence of drains and levees). The second is used to annotate wetland EVC boundaries.
2. **Land-use map**: this aids in interpretation of wetland catchment measures.
3. **Aerial photo of the wetland**: this aids in assessing whether there has been a change in the wetland boundary and buffer.

Instructions for generating maps

1. Select IWC Map on the mapping toolbar
2. In the resultant window pane that appears on the left-hand side of the screen:
   a. Select the type of map:
   b. ***Base Map*** (blank map of the wetland with roads and hydrology delineated)

      Imagery Map (aerial photo of the wetland)

      Land Use (map of land use surrounding the wetland)
   c. Enter the name of the wetland (if known) or its wetland number (from the DELWP wetland inventory)
3. When the map is generated (in one to two minutes), a link will appear on the left-hand side of the window pane, labelled 'IWC map'.
4. Select the link to download the map
5. Follow Steps 2–4 to generate all required maps.

Step 4: Collect preliminary information about the wetland

Certain information about the wetland should be obtained prior to the wetland visit to assist with the IWC assessment at the wetland (Table 6, page 18).

Table 6: Information to be obtained prior to the IWC field assessment to assist determination of measures at the wetland.

Section of field assessment sheet	IWC measures and other information	Useful information sources
Inundation status of wetland	• Number of years wetland has been dry	• Local knowledge from wetland manager or owner or NRM agency • Recent rainfall records
Wetland catchment sub-index	• Buffer extent • Adjacent land use	• Recent aerial photo of the wetland • Recent land use map generated in the IWC wetland mapping tool • Local knowledge from wetland manager or owner or NRM agency
Physical form sub-index	• Reduction in wetland area	• Original wetland area from the Pre European Wetlands spatial inventory available in the IWC wetland mapping tool (see Step 1 for instructions on selecting a wetland and viewing its attributes) • Local knowledge from wetland manager or owner or NRM agency • Recent aerial photo of the wetland • Historic aerial photos (available from the following website: http://services.land.vic.gov.au/maps/photomaps.jsp
	• Change in effective wetland area and bathymetry	• Wetland management plan • Recent aerial photo of the wetland when the wetland is full and dry available in the IWC wetland mapping tool (it may not be possible to obtain a recent photo with both dry and wet phases) • Local knowledge from wetland manager or owner or NRM agency
Hydrology sub-index	• Wetland water source (see Step 1 for instructions on selecting a wetland and viewing its attributes)	• Wetland Current inventory using the IWC wetland mapping tool: http://mapshare.maps.vic.gov.au/MapShareVic/index.html?viewer=MapShareVic.PublicSite&locale=en-AU Wetland management plan • Topographic map at scale 1:25,000 • Local knowledge from wetland manager or owner or NRM agency • Groundwater mapping (visualizing Victoria's groundwater) http://www.vvg.org.au • Groundwater Dependent Ecosystems Atlas: http://www.bom.gov.au/water/groundwater/gde
Water properties sub-index	• Activities that result in nutrient enrichment	• Wetland management plan • Local knowledge from wetland manager or owner or NRM agency • Recent aerial photo of the wetland available in the IWC
	• Wetland salinity classification • Determination of input of saline or fresh water to the wetland	• IWC wetland mapping tool • Local knowledge from wetland manager or owner or NRM agency • Local salinity management plan
Biota sub-index	• Determination of the EVCs • Determination of the EVC boundaries	• Wetland landscape profiles map • Wetland landscape profile diagrams (Appendix 2 of this document) • Wetland manager, land owner or NRM agency (CMA or Parks Victoria) • Expert knowledge (e.g. from DELWP biodiversity officers) of EVCs likely to be present at the wetland • Recent aerial photo of the wetland
	• Identification of weeds	• Local weed lists and field guides

Evidence of a change in wetland salinity information using the IWC wetland mapping tool

Evidence of a change in wetland salinity can be a change in vegetation, change in wetland fauna or change in actual salinity concentration (as observed by a salinity monitoring program, for example). For wetlands in the Current Wetlands spatial inventory, a change in the wetland's salinity classification from pre European to current is also evidence of a change in salinity. These classifications can be obtained from the IWC wetland mapping tool.

Salinity categories attributed to wetlands differ in the spatial inventories. In Pre European Wetlands, two salinity categories (fresh and saline) are represented in the Corrick Category attribute. In contrast, in Current Wetlands, four salinity categories (fresh, hyposaline, mesosaline, hypersaline) are represented in the salinity regime attribute (Table 7).

Follow the steps below to determine whether there has been a change in salinity between pre European and Wetland Current.

1. Navigate to the interactive mapping website at the following URL:

http://mapshare.maps.vic.gov.au/MapShareVic/index.html?viewer=MapShareVic.PublicSite&locale=en-AU

2. In the search field at the top right of the site, type in the wetland name or wetland identifier if known.
3. Select the wetland in the search results on the left hand side of the screen and select the result that is prefaced by 'Current Wetland'. View the wetland details on the left-hand side of the screen. The salinity field for Current Wetlands is salinity regime.
4. At the top of the information pane, adjacent to the layer name, click on the 'x' to return to the list of layers.
5. Select the wetland in the search results on the left-hand side of the screen and select the result that is prefaced by 'Pre European Wetland'. The salinity field for Pre European Wetlands is contained in the Corrick Category (Table 7).

Document the evidence of a change in salinity classification in the space provided on the field assessment sheet.

Table 7: Salinity classes for wetlands in Pre European Wetlands and Current Wetlands spatial inventories (Corrick and Norman 1976, 1980; Corrick 1981, 1982; DELWP 2016a).

Salinity classes	Salinity concentration (mg/L)
Pre European Wetlands	
Freshwater meadow Shallow freshwater marsh Deep freshwater marsh Permanent open freshwater	<3,000
Semi-permanent saline Permanent saline	>3,000
Current Wetlands	
Fresh	0–3,000
Hyposaline	3,000–10,000
Mesosaline	10,000–50,000
Hypersaline	>50,000

Recording preliminary information on the field assessment sheet

Table 8 provides a checklist of the preliminary information that should be transferred to the field assessment sheet before going into the field.

Table 8: Information to be recorded on the field assessment sheet prior to the field visit.

Information	Field assessment sheet page number
Details of wetlands listed on either the Pre European Wetlands and Current Wetlands spatial inventories or new wetlands (Step 1) **Wetlands listed on Pre European Wetlands or Current Wetlands spatial inventories** • Wetland identifier • Official wetland name if available (see The Register of Geographic Names, VICNAMES (http://maps.land.vic.gov.au/lassi/VicnamesUI.jsp) • Local name **Wetlands not listed on the Pre European Wetlands or Current Wetlands spatial inventories** • Vicgrid94 coordinates (use GDA94 datum) for the centre of the wetland (determined from Biodiversity Interactive Map, a topographic map, or geospatial application) • Official wetland name, if available (see The Register of Geographic Names, VICNAMES (http://maps.land.vic.gov.au/lassi/VicnamesUI.jsp) • Local name	1
Assessor details (Step 1) • Name • Phone number • Agency • Date of IWC training (month/year) • Required EVC assessment skills	1
Assessment area (Step 2) • Is the whole wetland to be assessed? (Yes/No) • If 'no', provide the area of the sampling plot that is to be assessed, attach a map showing the location of the sampling plot, and provide the coordinates of the centre of the plot.	1
Wetland water source (from the Current Wetlands spatial inventory and other sources – see Table 6) (Step 12)	4
Severity of change in salinity (Step 4) • Wetland salinity classification (see Tables 6 and 7)	5

Step 5: Prepare for the field visit

The final step before visiting the wetland is gathering the resources necessary to successfully complete the field assessment and to address Occupational Health and Safety (OH&S) issues associated with the field assessment.

Allow adequate preparation time for gathering the necessary resources and for contacting landholders prior to the wetland assessments. The order in which sites are sampled should take into account the distance between sites and the wetland's water regime. Try to assess sites that are closely grouped together, to avoid unnecessary travelling between sites. If assessments are being undertaken over a large area and a long time period, attempt to assess the wetlands that are likely to dry out first early in the assessment process. While the IWC can be used to assess dry wetlands, assessing the wetland vegetation may be difficult if the wetland has been dry for such a time that few wetlands plants are present.

To prevent the spread of high threat weeds and pathogens, a disinfectant cleaner known as Phytoclean should be sprayed onto footwear and the underside of vehicles and tyres prior to entering a new region. The disinfectant was specifically designed for the control of *Phytophthora cinnamomi*, but is an effective general-purpose microbiocide and algicide. Information can be found about the product at: http://www.phytoclean.com.au.

O **OH&S considerations**

- The OH&S considerations include preparing a Job Safety Analysis (JSA) (or equivalent document) for the field assessment. The JSA should identify the hazards associated with the assessment, a rating of the level of risk and measures to mitigate the hazards.
- Agencies undertaking IWC assessments should be aware and familiar with their OH&S policies and procedures relevant to field work, including sun protection policies, driving policies and field notification procedures. It is recommended that copies of the policies and procedures be carried in the field at all times.
- IWC assessors should be trained in level 2 first aid.
- Assessments should not be undertaken on days when the fire danger rating in the assessment area is , extreme or code red .For more information of fire danger rating systems visit http://www.cfa.vic.gov.au

Essential resources

The resources required for the assessment are as follows:

- ❑ IWC Assessment Procedure
- ❑ Field assessment sheets (located in Appendix 3 of this document). Note: two to five copies of the wetland vegetation quality sheet may be required. It is suggested that spare copies be available in the field, as one sheet is required per EVC assessed.
- ❑ Two copies of the wetland base map prepared in Step 3, labelled '1 of 2' and '2 of 2'
- ❑ Land-use map prepared in Step 3
- ❑ Aerial photo prepared in Step 3
- ❑ Preliminary information about the wetland collected in Step 4
- ❑ Set of wetland EVC benchmarks relevant to the wetland landscape profile. Wetland EVC benchmarks (DELWP 2022b) are contained in one document on the Resources page of the IWCDMS website http://iwc.vic.gov.au/resources
- ❑ Field guide to wetland Ecological Vegetation Classes – 2nd Edition (DSE 2012) – download available on the Resources page of the IWCDMS website http://iwc.vic.gov.au/resources
- ❑ Digital camera
- ❑ Calculator
- ❑ Compass
- ❑ GPS
- ❑ Personal protective equipment identified in an OH&S risk assessment (including snake-bite kit where appropriate)
- ❑ Phytoclean: disinfectant cleaner (information available at http://www.phytoclean.com.au

Optional resources

- ❑ Wetland plant identification guide(s)
- ❑ Weed identification guide(s)
- ❑ Flora of Victoria (https://vicflora.rbg.vic.gov.au)

Step 6: Review the field assessment sheets

Review the field assessment sheets and make a mental note of all of the measures that are required in the assessment. Complete the general section on page 1 of the field assessment sheets, including the date and the time the IWC assessment was commenced. Where required, circle the appropriate score and clearly write the score in the boxes provided, because this assists in accurate database entries of all required information.

Step 7: Walk around the assessment area

All of the measures in the assessment require the whole wetland to be observed, wherever practical (see Step 2). Walk around the whole wetland, if practical, and take note of the following activities and measures:

- wetland inundation status (Step 8)
- establishing a photo point (Step 9)
- wetland buffer and land-use intensity (Step 10)
- wetland boundary and changes in wetland area and wetland bathymetry (Step 11)
- activities that affect the water regime (Step 12)
- activities that affect nutrients and salinity (Step 13)
- activities that affect the wetland soils (Step 14)
- location and condition of the wetland EVCs (Step 15).

Step 8: Record the inundation status of the wetland

Record the inundation status of the wetland on Page 1 of the field assessment sheet by estimating the percentage of the whole wetland covered by (1) dry (unsaturated) soil, (2) waterlogged (saturated) soil and (3) surface water or (4) unknown/other, to the nearest ten percent. Taking into account any preliminary information collected in Step 4, record the wetland phase. If the wetland is dry (or no water present), mark the appropriate category for the length of time the wetland has been dry in years (if known) and the source of data.

Step 9: Establish photo point and take wetland photograph(s)

Photo point photos

Establishing a photo point and taking photographs of the wetland will aid in the interpretation of the wetland condition assessment. A minimum of one photo, depicting the whole wetland or a large part of the wetland, from a fixed position in the wetland (the photo point) is required. Establishing a photo point is important so that the photo can be taken in exactly the same location at a wetland for each successive IWC assessment. The location of the photo point should be documented using a GPS and marked on the base map. Consider ways of marking the photo point on the ground (a tree stump or other object), or note the location of a fixed object in the camera's view. Take the previous photo with you to assist in determining the photo point location.

The following tips will assist you in taking a good photograph:

- Equipment—use a digital camera or a smartphone with a good camera.
- Contrast—minimise contrast where possible—bright but clouded conditions are ideal; ensure the sun is behind you and that glare from the water surface is minimised.
- Format—take the photo on landscape orientation, and eliminate the sky as much as possible.
- Manual control—read the camera's user manual to familiarise yourself with manual control or exposure, film speed, aperture and shutter speed, because these may assist in producing a good-quality photograph.

The following details for each photo must be entered onto page 1 of the field assessment sheet:

1. coordinates of photo point (Vicgrid94/MGA) (for Vicgrid94 use GDA94 datum, UTM/UPS; if the MGA coordinate system is used, the zone must also be recorded)
2. direction faced when taking the photo (i.e. compass bearing between 0 and 360^{o})
3. camera photo number/code to assist you in uploading the correct photo against the assessment.

Wetland EVC photos

Photos of wetland EVCs can help interpret and document the condition of wetland vegetation. Photos of wetland EVCs are optional.

Photo file naming convention

The photograph file names will automatically be generated when they are uploaded into the IWCDMS, using the convention [wetland number]_[date]_[photo type]_[photo number]. The date is expressed as ddmmyyyy, photo type will be either photo point or EVC. If the photo is an EVC type the EVC number will also be included in the file name.

Step 10: Complete the wetland catchment measures

These measures are assessed outside the wetland boundary.

Wetland buffer assessment

Follow the instructions and record the information on page 2 of the field assessment sheet. The resources identified in Step 4, Table 6 will assist with the wetland buffer assessment. Mark the wetland buffer on the base map.

Identifying the wetland buffer

- The buffer is the native vegetation adjacent to the wetland (from the maximum inundation level outwards). For the purposes of the IWC measure, native vegetation is defined as vegetation in which native species make up more than 25% of the total understorey cover. Overstorey species, if present, must be predominantly native. Exotic vegetation can include transient (annual) weeds. The total understorey vegetation cover can be less than 25% (see Figure 2).
- Revegetated areas would be classed as native vegetation if they were based on species from the natural EVC and meet the above criteria. Mark these areas of revegetation on the base map.
- The buffer only includes native vegetation contiguous with the wetland, that is, where there is no break between the native vegetation and the wetland boundary. It may extend any distance away from the wetland, but the maximum buffer width class measured in the IWC is greater than 50 m. When calculating the average buffer width use 50 m for widths greater than 50 m to prevent the average from being biased by very wide buffers.
- When incursions/breaks in the buffer zone occur (such as walking tracks, vehicle tracks, footpaths, camping areas or other areas with no vegetation cover) and are less than 10% of the total buffer area, assess the buffer zone as if these breaks are not present.

Assessing the buffer width near a wetland or river

- In the situation where there is a river or other wetland located within 50 m of the wetland, only assess the buffer width between the wetland boundary and the edge of the river or other wetland. Do not include the vegetation on the other side of the river.

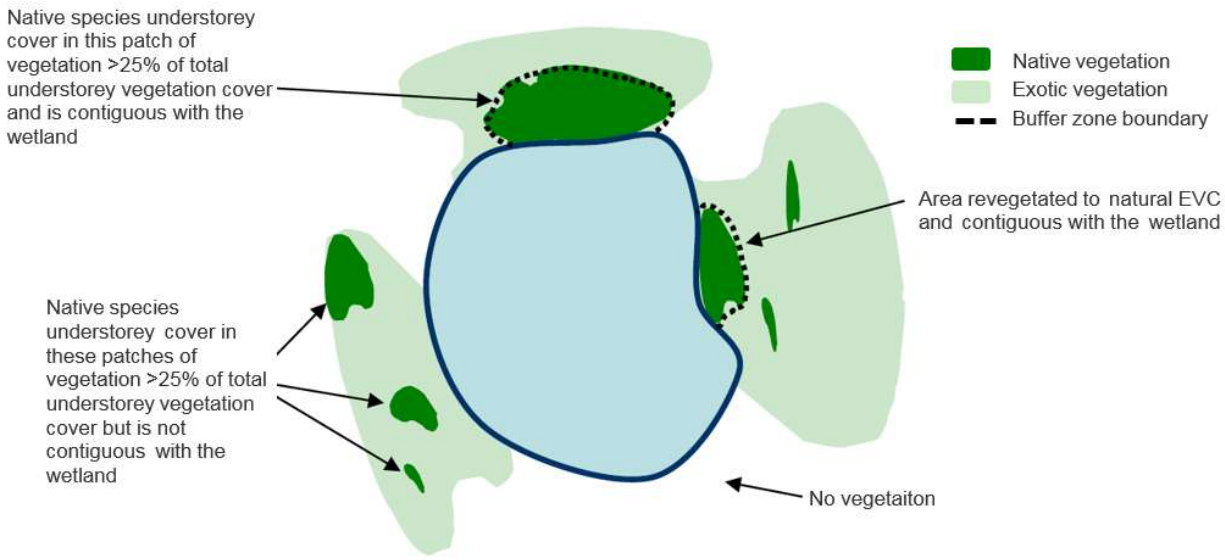

Figure 2. Conceptual diagram depicting native vegetation criteria required for the buffer zone.

A recent aerial photo of the wetland with the current wetland inventory may assist in determining the presence, shape and width of the wetland buffer.

For wetlands with irregular buffer widths, measure the width at as many locations as practicable to give an accurate average width.

The average buffer width is calculated over the part of the wetland that has a buffer, not the entire wetland perimeter, i.e. areas with no buffer are not included in the average.

The widest buffer measured in the IWC is the category >50 m. Areas of the buffer wider than 50 m should be considered 50 m for the calculation of the average. This will minimise biasing the buffer-width average.

Percentage of land in different land-use intensity classes adjacent to the wetland

Perform an on-ground inspection to determine the accuracy of adjacent land uses indicated on the land-use map (Step 3). If the land use differs to that indicated on the map, annotate the land-use map with the current land use, and document the observed differences on the field assessment sheet.

The IWC uses five land-use intensity classes, which can be identified using the guidance in Table 9. Mark these land-use intensity classes on the land-use map. Using the map, assess the percentage of adjacent land in each land-use intensity class and record it on page 2 of the field assessment sheet. The total must equal 100%.

Assess whether land use differs from that shown on land-use maps and/or aerial photos, and record ‘Yes’ or ‘No’ in box D provided on the field sheet, and annotate the changes on the base map.

Defining the area of adjacent land in which to assess land use

- The land use is to be assessed within 250 m of the wetland.
- In theory, land-use intensity should only be assessed within the surface water catchment of the wetland, because land use outside the surface water catchment will not affect the run-off patterns or quality of water that flows to the wetland.
- However, in practice, it is often difficult to define the surface water catchment, and wetland catchment mapping is generally not available. Therefore, land use is to be assessed in the whole 250-metre-wide area adjacent to the wetland boundary, unless this area includes areas of water.
- A river or another wetland and land beyond them should be excluded from the assessment if they are less than 250 m from the wetland being assessed. The remaining area should be treated as occupying 100% of the wetland catchment.

Table 9: Examples of land-use intensity classes.

Land use intensity class	Examples of land use
Very high	Built urban (including alpine resort development), industrial, intensive animal production, multiple-lane roads, multiple-track railway, aqueduct, water storage
High	Cleared land for urban development, irrigated agriculture (cropping, horticulture and pasture), broad acre cropping, medium- or high-density grazing, golf course, playing field, major roads (not multiple lane), vehicle tracks in peatland wetlands
Medium	Non-indigenous plantation forestry, low-density grazing, minor roads/tracks and railways
Low	Forestry in native forests, nature conservation with moderate to high recreational use, vehicle tracks (non-peatland wetlands). If vehicle tracks are present in peatland wetlands, assign class as High
Very low	Nature conservation with low recreational use

The remaining IWC assessment is within the current boundary of the wetland.

Step 11: Complete the physical form measures

A. Reduction in wetland area

The wetland boundary is defined by the maximum possible inundation level of the wetland. A reduction in wetland area is assessed by comparing the current boundary with the boundary shown on the Pre European Wetlands spatial inventory, or another pre-European wetland map, if available. A reduction in wetland area is the actual loss of wetland habitat such that the wetland, when full, occupies a smaller area than under natural conditions. Factors resulting in an ongoing reduction in wetland area include:

- infilling
- barriers to filling (such as levees or roads without culverts)
- channelisation in the wetland that permanently limits its maximum inundation
- fire (for peat-dominated wetlands only).

Determining whether the wetland area has been reduced:

1. Ensure you have a base map of the wetland annotated with the Pre European Wetlands and Current Wetlands boundaries (see Step 3). Note that due to a scale limitation in the IWC mapping tool, the pre-European wetland boundary may lie outside the screen area if it is much larger than the current wetland boundary. In this instance, zoom the map out to the desired scale and print the page using the web browser's print function.

2. Walk around the wetland and mark any changes to the current wetland boundary on the wetland base map (a recent aerial photo of the wetland may assist, see Step 3).
3. Use the grid on the base map to calculate the percentage reduction in wetland area between the boundary assessed in Step 2 and the Pre European wetland boundary and record on the field assessment sheet.

If there is a reduction in wetland area, indicate the reason (if known) and the time when the reduction in area took place (if known) on page 3 of the field assessment sheet.

Assessing a reduction in effective wetland area

- A reduction in wetland area is ongoing. It is not a temporary reduction in the extent of water present as would be associated with periodic drying of the wetland associated with its natural water regime.
- An enlargement of the wetland is considered an aspect of altered hydrology for the purposes of the IWC (DSE 2005).

B. Percentage of wetland where activities have resulted in a change in bathymetry

Follow the instructions and record the information on page 3 of the field assessment sheet.

Wetland bathymetry

Bathymetry is the underwater topography of the wetland defined by patterns in depth. This IWC measure estimates the percentage of the wetland where the bathymetry of the wetland has been significantly changed by excavation or landforming activities. These are activities which cause significant change in depth (e.g. digging of channels or dams) or which change the natural form of the bed (e.g. laser levelling, raised-bed cropping or building of mounds, siltation or deposition of sand-slugs).

- The superficial disturbance to wetland soils is not considered to be a change to the form of the wetland. Soil disturbance is measured separately.
- An enlargement of a wetland is considered an aspect of altered hydrology for the purposes of the IWC and is measured separately. Reduction in wetland area is measured separately in the first part of the physical form assessment.

The IWC uses four categories for estimating the severity rating for changes in wetland bathymetry (Table 10).

Table 10: Severity rating for types of wetland bathymetry change.

Severity rating	Examples of wetland bathymetry change
High	Change in bathymetry in which bed of wetland has been raised or lowered by >50 cm due to excavation and/or landforming activities listed above
Medium	Change in bathymetry in which bed of wetland has been raised or lowered by >10–50 cm due to excavation and/or landforming activities listed above
Low	Change in bathymetry in which bed of wetland has been raised or lowered by <10 cm due to excavation and/or landforming activities listed above
None	No evidence of change

Step 12: Complete the hydrology assessment

The hydrology assessment is the severity of change to the wetland's water regime. To inform the assessment, the water source(s) of the wetland must be identified, and activities that change the wetland's water regime selected (if present).

Wetland water source

More than one water source can be selected for the wetland. The water sources are consistent with those identified in the Current Wetlands spatial inventory, as follows:

- river/stream (water delivered via in-channel or over bank flows)
- local surface runoff
- groundwater
- artificial (direct discharge from agriculture/industry/ urban or environmental water delivered through channels and regulating structures).

The IWC wetland mapping tool (http://mapshare.maps.vic.gov.au/MapShareVic/index.html?viewer=MapShareVic.PublicSite&locale=en-AU) can be used to identify its current water source (see Step 1 for instructions on selecting a wetland and viewing its attributes). Other sources of information presented in Step 4, Table 6 may also be used.

Confidence and data source

For each water source, the level of confidence and the source of information used in its determination must be identified. Confidence is rated High, Moderate and Low and data sources can be:

- the Current Wetlands spatial inventory
- field data or observation
- local knowledge (landholder or land manager)

Following determination of the wetland water source(s), the assessment of the severity of change to the wetland's water regime involves identifying (1) the change in timing of inundation (season and duration) of the wetland from its natural state and (2) the change from its natural state of the water regime category (frequency and duration of inundation). Water regime categories and subcategories (i.e. permanent, seasonal, intermittent, episodic) from the Victorian wetland classification framework (DELWP 2016a) are used in the assessment of severity of change to the wetland's water regime (Table 11).

Table 11: Water regime categories and subcategories used to determine the severity of change in wetland water regime.

Category	Subcategory	Frequency of inundation	Duration of inundation
Permanent		Constant, annual or less frequently	Never dries or dries rarely (i.e. holds water at least 8 years in every 10), but levels may fluctuate within or between years
Periodically inundated	Seasonal	Annual or near-annual inundation (i.e. fills 8–10 years in every 10)	1–8 months
	Intermittent	Infrequent—holds water, on average 3–7 years in every 10	>1 month to more than 1 year, then dries
	Episodic	Infrequent— holds water, on average <3 years in every 10	>1 month to more than 1 year, then dries

Identify the confidence (low, medium or high) in the assessment and source of data that contributed to the assessment (field data or observation, local knowledge, wetland management plan or report, or other).

Step 13: Complete the water properties measures (nutrient enrichment and change in salinity)

A. Severity of nutrient enrichment

To inform this assessment, the activities that lead to nutrient enrichment (if present) must be identified from those listed in the box below.

Activities leading to nutrient enrichment of the wetland

- ☐ Discharge of nutrient-rich water to the wetland (e.g. from sewage, industrial effluent or irrigation water)
- ☐ Drainage of nutrient-rich water into the wetland from an urban area (via a drain)
- ☐ Runoff of nutrients to wetland (e.g. from fertilizer application or grazing)
- ☐ Grazing by livestock in the wetland
- ☐ Grazing by feral animals in the wetland (e.g. pigs, goats, deer, rabbits, horses)
- ☐ Application of fertilizer in the wetland
- ☐ Aquaculture
- ☐ Other

Following determination of these activities, the severity of nutrient enrichment must be identified. The options for severity are: no enrichment, low, medium and high. Ensure the confidence (low, medium or high) and the source of data that contributed to the assessment (field data or observation, local knowledge, wetland management plan or report, or other) is identified in the assessment.

B. Severity of change in salinity

To inform this assessment, the activities that change the salinity of the wetland from its natural state (if present) must be identified. These are listed in the box below.

In addition to these activities, there may be evidence for a change in the salinity. For example, a change in vegetation, change in wetland fauna, change in actual salinity concentration (observed by a salinity monitoring program for example) or a change in the wetland's salinity classification from pre European to current. The salinity classifications for wetlands in the Current Wetlands spatial inventory can be obtained from the IWC wetland mapping tool (http://mapshare.maps.vic.gov.au/MapShareVic/index.html?viewer=MapShareVic.PublicSite&locale=en-AU). See Step 4 (Tables 6 and 7) for further guidance.

Activities or processes leading to a change in salinity

- Saline groundwater intrusion resulting in an increase in salinity from its natural state
- Saline water intrusion from the marine environment resulting in an increase in salinity from its natural state
- Saline water is unnaturally delivered to a fresh or brackish wetland
- Fresh water is unnaturally delivered to a saline wetland
- Other

Input of saline water to wetlands

Saline water originating in irrigation areas or from industry may be disposed into wetlands. An example is the disposal of saline water from Barr Creek into the Tutchewop lakes which are managed as salinity disposal basins.

Following determination of these activities, the severity of the change in salinity must be identified. The options for severity are no change (to very low), low, medium and high. Ensure the confidence (low, medium or high) and the source of data that contributed to the assessment (Current Wetlands/Pre European Wetlands spatial inventories, field data or observation, local knowledge, wetland management plan or report, or other) is identified in the assessment.

Step 14: Complete the soils measure

Percentage and severity of wetland soil disturbance

Soil disturbance in the context of the IWC refers to physical disturbance of the soil structure and profile, but does not include activities that change the physical form (excavation and landforming). These are assessed in the physical form sub-index.

Activities that cause soil disturbance (if present) must be defined in the assessment. These are:

- pugging by livestock
- disturbance or pugging by feral animals (e.g. pigs, goats, deer, rabbits, horses)
- carp mumbling
- trampling by humans
- cultivation
- driving of vehicles in the wetland
- other.

Where to assess soil disturbance

Soil disturbance is to be assessed where the wetland soils are visible (i.e. above the water level and into the water where the soil is clearly visible). However it can also be assessed when the soils are not visible if there is recent prior knowledge of disturbance, its extent and severity.

If the wetland is dry, assess the whole wetland to the wetland boundary. If the wetland is full, assess the soil disturbance around the edge of the wetland to a maximum distance outwards of 1 m. If the wetland is partially full, assess the area between the water level and the wetland boundary and in the water where the soil is clearly visible.

The IWC uses four categories for estimating the rating for soil disturbance severity (high, medium, low, no disturbance). Examples of these are presented in Table 12 (page 30) and conceptually in Figure 3 (page 30). Follow the instructions on page 6 of the field assessment sheets to complete the soil disturbance severity assessment. See Plates 1 to 6 for examples of some of the types of soil disturbance described in Table 12 (page 30).

Table 12: Severity rating for types of soil disturbance.

Severity rating	Soil disturbance examples
High	• High density of pug marks (page 31, Plate 4) • Severe soil disturbance by livestock (aside from pugging, e.g. erosion or uprooted vegetation) • High density of deer or feral pig wallow (page 31, Plate 5) • High density of carp mumbling (page 31, Plate 6) • High density of rabbit diggings • Rabbit warrens present • High density of human trampling • High density of vehicle tracks • Cultivation
Medium	• Medium density of pug marks (page 31, Plates 2 and 3) • Medium level of soil disturbance by livestock (aside from pugging, e.g. erosion or uprooted vegetation) • Medium density of deer or feral pig wallow • Medium density of carp mumbling • Medium density of rabbit diggings • Medium density of human trampling • Medium density of vehicle tracks
Low	• Low density of pug marks • Slight soil disturbance by livestock (aside from pugging, e.g. erosion or uprooted vegetation) • Low density of deer or feral pig wallow • Low density of carp mumbling • Low density of rabbit diggings • Low density of human trampling • Low density of vehicle tracks (page 31, Plate 1)

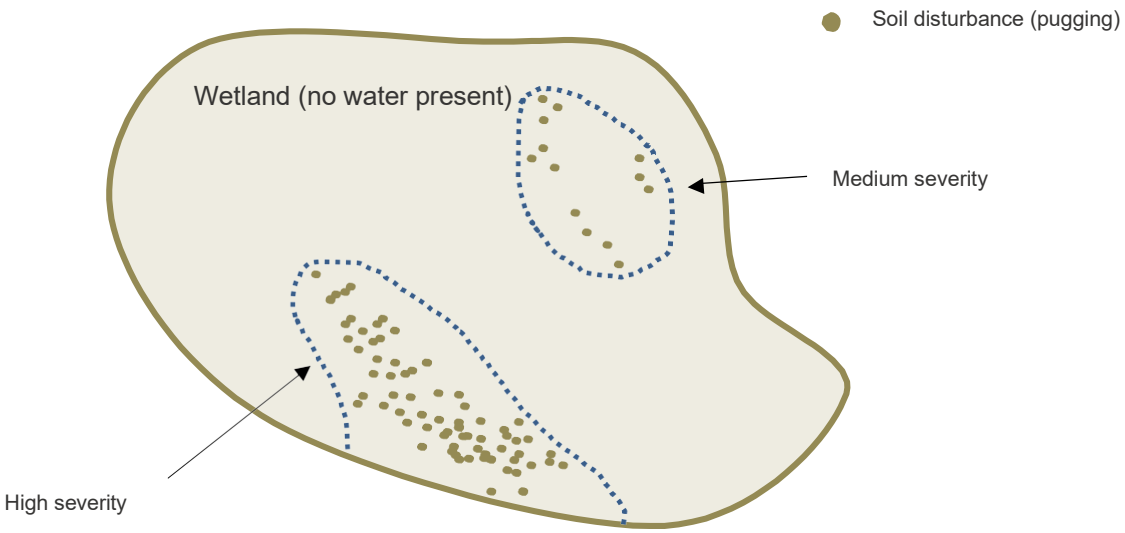

Figure 3. Conceptual diagram depicting areas with different severities of soil disturbance (based on the criteria in Table 12), using pugging as an example.

Plate 1. A wetland with shallow vehicle tracks (low severity). Photo: Michele Kohout.

Plate 2. An alpine bog with a moderate density of pug marks by horses (medium severity). Photo: Arn Tolsma.

Plate 3. Pugging by deer at moderate density (medium severity). Photo: Rohan Bilney.

Plate 4. Photo showing high-density pugging by livestock (high severity). Photo: Ayesha Burdett.

Plate 5. Photo showing a deer wallow in an alpine bog (high severity). Photo: Arn Tolsma.

Plate 6. Barmah Lake in the Barmah–Millewa Forest with high density of carp mumbling (high severity). Photo: Ivor Stuart.

Step 15: Complete the biota (wetland vegetation) measures

The assessment of vegetation quality involves assessing each of the EVCs present in the wetland. There are presently 158 relevant wetland EVCs (DELWP 2022a,b). These are assessed using a method developed for wetland vegetation quality that involves assessing four attributes: critical life-form groups, weeds, indicators of altered processes, and vegetation structure and health. The background to the development of the method, a description of the method, and information on the scoring are discussed in 'Index of Wetland Condition – Assessment of Wetland Vegetation– December 2021' (DELWP 2022a).

The quality of wetland vegetation is assessed by comparison with a relatively undisturbed system of the same vegetation type as attributed in benchmarks for each wetland EVC. The benchmark descriptions (DELWP 2022b) include a brief description of the wetland EVC, followed by notes on the EVC distribution, a list of indicator species for the EVC, and benchmarks for each of the four attributes to be assessed (critical life-form groups, weeds, indicators of altered processes, and vegetation structure and health). EVC benchmark descriptions are available on the Resources page of the IWCDMS website http://iwc.vic.gov.au/resources.

Identification of EVCs

Wetland EVCs will be present within and adjacent to the mapped wetland boundary. Indicate on the base map all EVCs within the wetland boundary. Only the area within the wetland boundary should targeted for assessment and, of that area, only vegetated areas should be assessed. Vegetated areas are all EVCs other than EVC 990 (unvegetated).

To aid in the identification of EVCs, Appendix 2 outlines landscape profiles, components and EVCs that may be present in each component.

Once a list of possible EVCs for the wetland has been determined, the benchmark description for each should be consulted. The EVC description, notes on distribution and indicator species should be used to confirm which EVCs are present.

In some cases, aggregate EVCs (e.g. Brackish Lake Aggregate, Billabong Wetland Aggregate) can be used to assess the relevant wetland habitat where the individual EVC components cannot be identified or resolved.

Unknown/unclassified EVC (EVC 999)

There is no benchmark for EVC 999. The allocation of EVC 999 will generally imply that the wetland is outside of the range where the condition can sensibly be assessed, for example through environmental degradation or prolonged drought.

In situations when an EVC is completely modified (for example the wetland has been 100% cropped), the EVC should be assessed as EVC 999, following the same process as other EVCs. All attributes, except weeds, will score 0. Note that if the site is cultivated for cropping, the crop will constitute introduced species and attract a likely score of up to 7/25 (if not supporting high threat species).

Where EVC 999 has developed due to prolonged drought, and future inundation events are still possible, the vegetation can generally only be assessed if it is known what EVC the current vegetation has developed from, or a sensible estimation of representation of likely prior flora can be made.

Unvegetated areas (EVC 990)

Areas lacking vascular vegetation (open water, bare soil or mud) are allocated to EVC 990. There is no benchmark for this EVC and it is excluded from calculation of wetland vegetation scores; however, it should still be mapped. It is important to look for vegetation in open water by wading in if possible, or by checking the downwind corner of the wetland for washed up vegetation. If vegetation is found, then the appropriate EVC should be identified and assessed.

A. EVC assessment summary

Follow the instructions and record the information on page 7 of the field assessment sheet.

Several EVCs may be present in a wetland. Each EVC should be assessed as part of the IWC assessment. Where an EVC appears to be relatively uniform or has small patches of subjectively different quality, the EVC should be assessed as a whole. Where there is a significant difference in quality between two or more distinct parts of an EVC, the EVC should be divided into separate units for assessment and each unit assessed separately. This may occur, for example, where a fence prevents livestock from grazing part of the EVC.

In situations when an EVC is completely modified (for example the wetland has been 100% cropped), the EVC should be assessed using EVC 999 (Unknown/Unclassified), and assessed following the same process as for other EVCs. All attributes, except weeds, will score 0. Note that if the site is cultivated for cropping, the crop will constitute introduced species and attract a likely score of up to 7/25 for the weed component.

It is necessary to record the EVCs present (and units, if identified) on page 7 of the field assessment sheet, and to mark their distribution within the wetland boundary on base map 2. The proportion of the vegetated area of wetland covered by each EVC (or EVC unit) should also be recorded.

The individual EVCs (or units) should now be assessed. After each is assessed, the EVC scores are transferred to the EVC assessment summary, and the biota sub-index score can be calculated following the instructions on page 6 of the field assessment sheet.

Assessment of biota (wetland vegetation)

Follow the instructions and record the information on page 8 of the field assessment sheet. Use a separate copy of page 8 to assess each EVC (or EVC unit) in the wetland. Ensure that the EVC that was assessed is clearly identified on the sheet. Refer to DELWP (2022a) for definitions for each of the wetland vegetation attributes.

Where to assess an EVC or EVC unit

The assessment of individual EVC (or EVC unit) is over the whole area occupied by the EVC (or unit). This involves inspecting the whole EVC (or unit) on the ground before evaluating vegetation quality against the benchmarks. If this is not possible because of access difficulty or poor visibility (e.g. in EVCs dominated by dense reeds), inspect sites within the EVC that appear to cover the full range of quality within the EVC. A recent high quality aerial photo may assist in determining which parts to inspect. In larger or more complex wetlands, a representative sample can be identified for assessment.

Determining if an EVC should be assessed

For some EVCs there are conditions when the EVC should not be assessed. These are indicated on the EVC benchmark. If the EVC was not assessed, record 'NA' on EVC assessment summary (page 6 of the field assessment sheet) instead of the score. It is not possible to assign a biota score in this instance.

B. Critical life-form groups

The method of interpretation of critical life forms in the IWC has some significant differences from the assessment of life forms used in the Habitat Hectares method of the Native Vegetation Framework. For IWC assessments, each species should be scored in only one of the critical life-form groups. If there is any doubt as to which group is appropriate, the appropriate group is selected on the basis of the characteristics of the relevant species at maturity (DELWP 2022a).

Section 1 of the EVC benchmarks specifies the critical life-form groups for each EVC. The benchmark specifies the minimum species diversity and/or cover levels for each group (DELWP 2022b).

Scoring is based on the presence of life-form groups and whether or not they are substantially modified. A critical life-form group is considered to be substantially modified if it fails to meet the benchmark thresholds for the number of species and/or percentage cover. The score is determined using the scoring guide on the field assessment sheet.

See Section 1 of the EVC benchmark. Size range guidelines for critical life forms are provided in Table 13.

Table 13. Size ranges used for critical life forms in the IWC

Life form	Size classes				
	Tiny	Prostrate	Small	Medium	Tall
Shrubs	NA	<20 cm	20 cm–<1 m	1–3 m	>3 m
Herbs	<5 cm	<5 cm and carpet or mat-forming	5 cm–<15 cm	15 cm–<50 cm	>50 cm
Graminoid	<10 cm	<10 cm and mat-forming	10 cm–<30 cm	30 cm–<1m	>1 m

Notes on critical lifeform size ranges

- The range of a given size class can differ from the most similar Vegetation Quality Assessment category used in DSE (2004).
- The term semi-shrubs is applied to robust herbs which are to some extent woody – where this term is used in the benchmarks the relevant size range for herbs applies.
- Graminoids can variously include grasses, sedges, rushes, restiads, mat-rushes and grass trees. Where the term 'monocot' is used in a generalised way in the benchmarks, the relevant size range as for graminoids applies.
- 'Cane-grass' is sometimes used in the benchmarks as a life-form (rather than a more generalised 'medium to tall grasses') – this term applies to hard-stemmed grasses, notably of the genus *Eragrostis* – these species can appear either tufted or non-tufted, according to growing conditions and grazing pressure.
- The term 'tiny floating aquatics' is self-explanatory – these species are not rhizomatous, comprising detached individual plants up to a few cm in size but frequently much smaller.

C. Weeds

The scoring is based on the proportionate cover of all weeds or crop species in the EVC (i.e. proportion of vegetation cover that are introduced species), and the proportion of that cover that are high-threat weeds. High-threat weeds are those with the ability to displace native vegetation (DELWP 2022a). High-threat weed species are specified in Section 2 of the EVC benchmark. In addition to these, the assessor can include other weeds as high-threat weeds if they have the ability to displace native vegetation. A table for documenting high-threat weeds is included on page 9 of the field assessment sheets. The benchmark also specifies instances where it is appropriate to overlook low-threat weeds (DELWP 2022b).

Environmental weeds can include species native to parts of Victoria but occurring outside their natural range—e.g. *Acacia longifolia* subsp. *sophorae*, *Leptospermum laevigatum* and *Pittosporum undulatum*. In some cases, it may be necessary to decide whether invasive species represent local dryland species that have opportunistically colonised wetlands as a consequence of modified hydrology (in which case they will represent indicators of altered processes), or whether these are invasive species operating outside their natural range (in which case they will represent weeds).

If a species interpreted as representing a weed is also reflecting changes to hydrological conditions, its performance within the wetland could also contribute to consideration of altered processes.

It is recommended that the assessor enters flora and fauna species details onto the Victorian Biodiversity Atlas, which can be accessed at the following URL: https://vba.dse.vic.gov.au.

D. Indicators of altered processes

This attribute assesses indicators of change as reflected by changes in performance of relevant species. The assessment focuses on invasions of habitat by species or life forms indicative of hydrological change, but also includes mortality caused by hydrological change (DELWP 2022a). Invasions can be by indigenous or introduced species occurring outside their normal range of habitat or performance.

Scoring is based on the percentage of critical life-form groups present (specified in Section 1 of the benchmark description) and the presence and severity of any altered process recognised for the EVC (some of which are described in Section 3 of the benchmark description).

E. Vegetation structure and health

This attribute assesses the condition or indicators of poor health of the structurally dominant species or life form in the EVC (DELWP 2022a). Section 4 of the benchmark description specifies the structural dominants for the EVC, their benchmark cover, and any additional guidance on assessing vegetation structure and health.

The percentage of cover of structural dominant(s) in the EVC that is healthy is determined. Normal seasonal dieback (e.g. of herbaceous species) is still indicative of healthy vegetation.

Where guidelines for assessing the relevant indictors are not provided on the benchmark, refer to DELWP (2022a) Section 3.3.1 (Indicators of altered processes) for guidance.

Notable species (e.g. rare or threatened)

Where there is notable flora present at an IWC assessment site, the assessor is encouraged to keep a record of the species observed. A table for documenting notable flora species is on page 9 of the field assessment sheets.

It is recommended that the assessor enters flora and fauna species details onto the Victorian Biodiversity Atlas, which can be accessed at the following URL: https://vba.dse.vic.gov.au.

Determining the final EVC score for the wetland

Transfer the score for each EVC (or EVC unit) to the EVC assessment summary on page 7 of the field assessment sheets and follow the instructions to calculate the biota sub-index score.

Scoring EVCs and the biota sub-index

- Each EVC in the wetland is assessed separately and assigned a score out of 100.
- The score for the individual EVC is then multiplied by the proportion of the vegetation area of the wetland that it occupies. The scores are then added together. A maximum score of 100 is possible once the individual EVC scores have been adjusted to account for their relative proportions.
- The sum of all the individual EVC scores (weighted by proportion of the wetland occupied) is then divided by 5 to get the biota sub-index score which has a maximum of 20 which is the same as for the other IWC sub-indices (see Section 2.2).

Step 16: Check that all IWC measures have been completed

Record the time the IWC assessment was finished on page 1 of the field assessment sheet. This provides a record of the time taken to complete the assessment.

Before leaving the field:

1. Review the field assessment sheet and ensure all measures have been assessed.
2. If the IWC assessment has only covered a sample plot within the wetland (as outlined in Step 2), ensure a map is attached that shows the location of the plot that was assessed, and check that the area of the plot is recorded on page 1 of the field assessment sheet.
3. Ensure the wetland base map, wetland EVC map, land-use map and aerial photo has been labelled and annotated with the required information (see Step 3).

Step 17: Data entry onto the Index of Wetland Condition Data Management System

The Index of Wetland Condition Data Management System (IWCDMS) is an on-line web-based system (https://iwc.vic.gov.au). The database is administered by DELWP, and questions can be directed to IWC.support@delwp.vic.ogov.au.

Data is stored in a relational database. The data fields are based on those in the IWC field assessment sheet. The IWCDMS was designed so that data entry from the field assessment sheet was as simple as possible. The order and layout of the screens are similar to the field assessment sheets. The system includes features designed to minimise user error and automate calculations for scoring. In addition to the IWC data collected in the field, attachments such as images and documents can be uploaded to the IWCDMS. Both detailed and simple reports can be generated for each IWC assessment.

Assessors are required to enter data onto the IWCDMS within 4 weeks of data collection in order to reduce the risk of data loss, or of incorrect or incomplete data entries. Hard copies of field assessment sheets, annotated maps and photo point images must be held for a minimum of 5 years by the organisation leading the project and made available to DELWP for auditing purposes.

IWC Field Assessment Tool

A field data collection and entry tool is available at https://iwc.vic.gov.au/miwc/. This should be used in conjunction with the IWC Assessment Procedure. The tool can upload data directly to the IWCDMS.

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Appendix 1 Wetlands EVCs

Wetland EVC name	Wetland EVC number
Alkaline Basaltic Wetland Aggregate	1111
Alluvial Plains Semi-arid Grassland	806
Alluvial Plains Semi-arid Shrubland (previously known as EVC 808 Lignum Shrubland)	A123#
Alpine Creekline Herbland	239
Alpine Fen	171
Alpine Heath Peatland	288
Alpine Hummock Peatland	1011
Alpine Short Herbland	905
Aquatic Grassy Wetland	306
Aquatic Herbland	653
Aquatic Sedgeland	308
Billabong Wetland Aggregate	334
Black Box Wetland	369
Blocked Coastal Stream Swamp	875
Brackish Aquatic Herbland	537
Brackish Grassland	934
Brackish Herbland	538
Brackish Lake Aggregate	636
Brackish Lake Bed Herbland	539
Brackish Lignum Swamp	947
Brackish Sedgeland	13
Brackish Sedgy Shrubland	1114
Brackish Shrubland	973
Brackish Wetland Aggregate	656
Calcareous Sedgy Shrubland	A106#
Calcareous Wet Herbland	591
Cane Grass Wetland	291
Cane Grass Wetland/Aquatic Herbland Complex	602
Cane Grass Wetland/Brackish Herbland Complex	606
Cane Grass Wetland/Alluvial Plains Semi-arid Shrubland Complex	A117#
Claypan Ephemeral Wetland	284
Coastal Dry Saltmarsh	A110*
Coastal Ephemeral Wetland	976
Coastal Hypersaline Saltmarsh	A111*
Coastal Lagoon Wetland Aggregate	11

Wetland EVC name	Wetland EVC number
Coastal Saline Grassland	A109*
Coastal Saltmarsh Aggregate	9
Coastal Tussock Saltmarsh	A112*
Dune-soak Woodland	673
Dwarf Floating Aquatic Herbland	949
Ephemeral Drainage-line Grassy Wetland	678
Estuarine Flats Grassland	914
Estuarine Reedbed	952
Estuarine Scrub	953
Estuarine Wetland	10
Fern Swamp	721
Floodplain Grassy Wetland	809
Floodplain Riparian Woodland	56
Floodplain Thicket	280
Floodplain Wetland Aggregate	172
Floodway Pond Herbland	810
Floodway Pond Herbland/Riverine Swamp Forest Complex	945
Forest Bog	723
Forest Creekline Sedge Swamp	728
Forest Wet Flat Herbland	A129#
Freshwater Lake Aggregate	718
Freshwater Lignum – Cane Grass Swamp	954
Freshwater Lignum Shrubland	657
Gahnia Sedgeland	968
Granite Rock-pool Wetland	1112
Grassy Red Gum Swamp	A127#
Grassy Riverine Forest	106
Grassy Riverine Forest/Floodway Pond Herbland Complex	811
Grassy Riverine Forest/Riverine Swamp Forest Complex	812
Grey Clay Drainage-line Aggregate	124
Herb-rich Gilgai Wetland	956
Hypersaline Inland Saltmarsh Aggregate	708
Intermittent Swampy Woodland	813
Intermittent Swampy Woodland/Floodway Pond Herbland Complex	A121#
Intermittent Swampy Woodland/Lake Bed Herbland Complex	A119#
Intermittent Swampy Woodland/Riverine Grassy Woodland Complex	822
Lake Bed Herbland	107
Lake Bed Herbland/Floodway Pond Herbland Complex	A122#

Wetland EVC name	Wetland EVC number
Lava Plain Ephemeral Wetland	974
Lignum Swamp	104
Lignum Swampy Woodland	823
Mangrove Shrubland	140
Montane Bog	966
Montane Boggy Woodland	A130#
Montane Riparian Thicket	41
Montane Riparian Woodland	40
Montane Sedgeland	148
Montane Swamp	318
Perched Boggy Shrubland Aggregate	185
Plains Grassy Wetland	125
Plains Grassy Wetland/Aquatic Herbland Complex	755
Plains Grassy Wetland/Brackish Herbland Complex	767
Plains Grassy Wetland/Calcareous Wet Herbland Complex	958
Plains Grassy Wetland/Lignum Swamp Complex	A101#
Plains Grassy Wetland/Sedge-rich Wetland Complex	959
Plains Grassy Wetland/Spike-sedge Wetland Complex	960
Plains Rushy Wetland	961
Plains Saltmarsh Aggregate	888
Plains Sedgy Wetland	647
Plains Sedgy Wetland/Sedge Wetland Complex	1010
Plains Sedgy Woodland	283
Plains Swampy Woodland	651
Plains Swampy Woodland/Lignum Swamp Complex	784
Red Gum Swamp	292
Red Gum Swamp/Cane Grass Wetland Complex	A114#
Red Gum Swamp/Plains Rushy Wetland Complex	A115#
Riparian Fern Scrub	A120#
Riparian Scrub	191
Riparian Thicket	59
Riverine Chenopod Woodland	103
Riverine Claypan Herbland	A128#
Riverine Ephemeral Wetland	975
Riverine Swamp Forest	814
Riverine Swampy Woodland	815
Rushy Riverine Swamp Aggregate	804
Saline Aquatic Meadow	842

Wetland EVC name	Wetland EVC number
Saline Lake Aggregate	717
Saline Lake-verge Aggregate	648
Salt Paperbark Woodland	676
Saltmarsh-grass Swamp	A113*
Samphire Shrubland	101
Sandy Stream Pond Aggregate	A124#
Sea-grass Meadow	845
Seasonally Inundated Shrubby Woodland	195
Seasonally Inundated Sub-saline Herbland	196
Sedge Wetland	136
Sedge Wetland/Aquatic Herbland Complex	A102#
Sedge Wetland/Aquatic Sedgeland Complex	963
Sedge Wetland/Brackish Herbland Complex	1113
Sedge Wetland/Calcareous Wet Herbland Complex	883
Sedge-rich Wetland	281
Sedgy Riverine Forest	816
Sedgy Riverine Forest/Riverine Swamp Forest Complex	817
Sedgy Swamp Woodland	707
Shell-beach Herbland	964
Sink-hole Wetland Aggregate	908
Spike-sedge Wetland	819
Spring-soak Woodland Aggregate	80
Stony Rises Pond Aggregate	857
Sub-alpine Pond Herbland	913
Sub-alpine Wet Heathland	210
Sub-alpine Wet Sedgeland	917
Submerged Aquatic Herbland	918
Sub-saline Depression Shrubland	820
Swamp Heathland Aggregate	49
Swamp Scrub	53
Swamp Scrub/Gahnia Sedgeland Complex	2004
Swampy Riparian Woodland	83
Swampy Woodland	937
Sweet Grass Wetland	920
Tall Marsh	821
Unvegetated (open water/bare soil/mud – 'Non Vegetation')	990
Unknown/unclassified	999
Wet Heathland	8

Wetland EVC name	Wetland EVC number
Wet Heathland/Plains Grassy Wetland Complex	A104#
Wet Heathland/Plains Sedgy Wetland Complex	A105#
Wet Heathland/Sedge Wetland Complex	931
Wet Saltmarsh Herbland	A107*
Wet Saltmarsh Shrubland	A108*
Wet Sedgy Herbland	A116#
Wet Swale Herbland	12
Wet Verge Herbland	A118#
Wet Verge Herbland/Floodway Pond Complex	A125#
Wet Verge Sedgeland	932
Wet Verge Sedgeland/Sedge Wetland Complex	A126#

* These EVCS represent resolution of the potential components of EVC 9 Coastal Saltmarsh Aggregate. They are presented in more detail in the 'Victorian Saltmarsh Study 2010 (Boon et al. 2011). Of these, only A113 is recognised as having occurrences outside coastal saltmarsh habitats. To date these have not been adopted within DELWP's vegetation quality assessment framework.

#These EVCs are additional wetland Ecological Vegetation Classes that to date have not been adopted within DELWP's vegetation quality assessment framework.

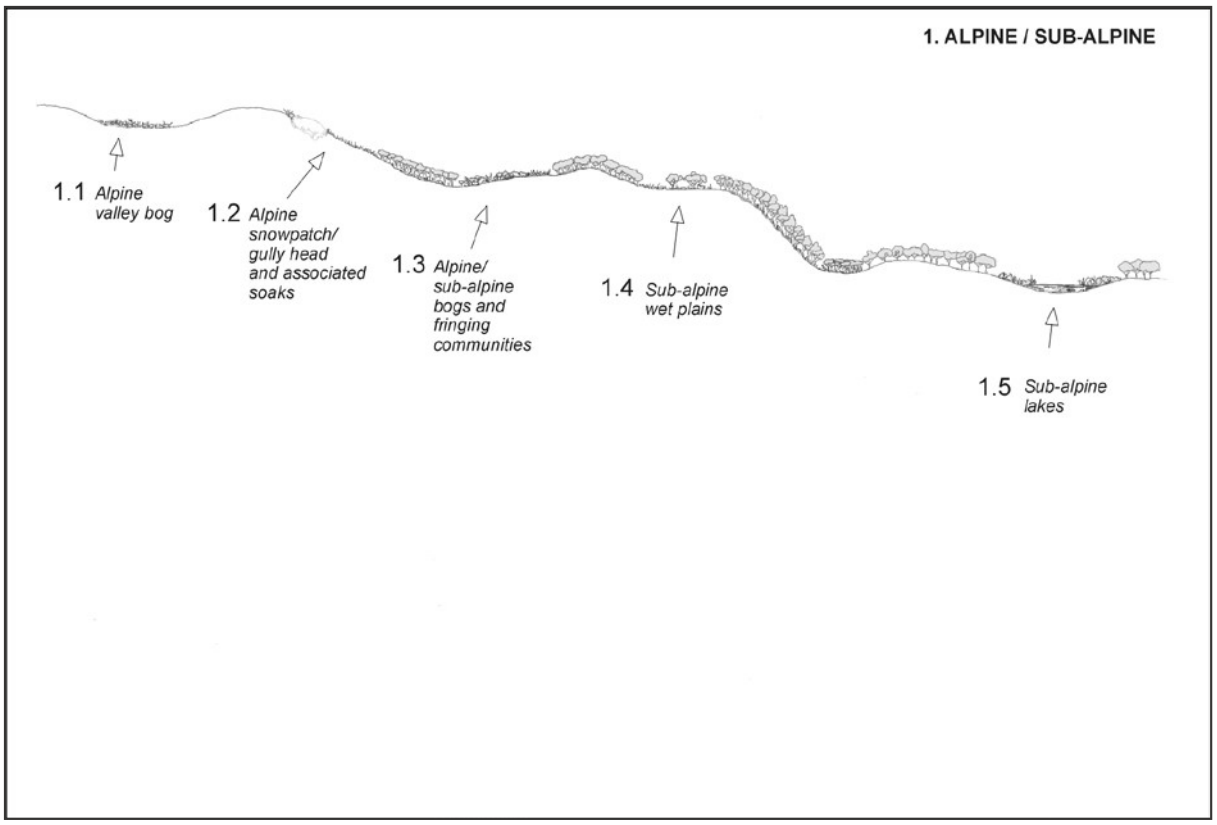
Appendix 2 Wetland landscape profiles and components with wetland EVCs

The ecological contexts described under these headings are not necessarily mutually exclusive. In instances where the ecological context of a given wetland overlaps more than one of these headings, it is intended that the relevant ecological vegetation class (EVC) can be identified through any of the potentially relevant headings.

1. ALPINE/SUB-ALPINE: Wetlands associated with higher mountain areas of eastern Victoria, within areas subject to sustained winter snow (generally above 1200 m elevation, but sometimes extending lower with cool air drainage).
2. MONTANE: Wetlands associated with high elevation areas (generally within 700–1200 m elevation) of eastern Victoria below the sub-alpine zone. Subject to cold air drainage, but below the zone of sustained winter snow.
3. LOWER MONTANE TO FOOTHILL/WET FOREST: Wetlands of gullies and drainage lines within taller, denser forest country (e.g. East Gippsland, South Gippsland, Central Highlands and Otways).
4. HILLS: FOOTHILLS, INLAND SLOPES AND HILLY NEAR-COASTAL: Wetlands associated with drainage lines and wet flats of at least moderate rainfall foothill country (south of divide and moister inland slopes, generally >650 mm rainfall per annum).S
5. DRIER HILLS AND TABLELANDS (MAINLY WESTERN) AND NORTHERN SLOPES: Wetlands associated with drainage lines, springs and soaks, swales and wet flats of lower rainfall hilly areas (specifically north-east hills, drier Midlands of north-central Victoria and the elevated plateau of the Dundas Tablelands, generally <650 mm rainfall per annum).
6. LOWLAND GRASSY PLAINS – WESTERN VOLCANICS: Wetland systems associated with basaltic terrain of (southern) western to central Victoria.
7. LOWLAND GRASSY PLAINS – RIVERINA PLAINS (sedimentary): Wetland systems associated with sedimentary alluvial plains of northern Victoria (within the basin of the Murray River and tributaries, approximately east of Loddon River).
8. LOWLAND GRASSY PLAINS – WIMMERA (TO SOUTHERN MALLEE): Wetland systems associated with inland sedimentary alluvial plains of further western to north-western Victoria (approximately west of Loddon River).
9. LOWLAND GRASSY PLAINS – COASTAL/SOUTHERN PLAINS: Wetland systems associated with relatively fertile (mostly clay) sedimentary plains south of the Divide.
10. LOWLAND HEATHY/SANDY: Wetland systems associated with relatively less fertile (mostly acidic sandy) sedimentary soils (e.g. sand sheets and dune swales), mostly south of the Divide but extending inland in south-west Victoria (e.g. Grampians, Little Desert).
11. MALLEE – NON-RIVERINE: Wetlands associated with the Mallee country of further north-west Victoria.
12. RIVERINE – MID-MURRAY: Wetlands associated with the riverine floodplain of the Murray River and tributaries (approximately upstream of Kerang).
13. RIVERINE – MALLEE: Wetlands associated with the riverine floodplain of the Murray River and tributaries (approximately downstream of Kerang).
14. NEAR COASTAL: Wetlands associated with near-coastal situations (especially calcareous dune systems and blocked drainage lines) and including those with tidal or estuarine influences.
15. LOWLAND RIPARIAN FLOODPLAIN: Wetlands associated with floodplains of major streams outside of the Victorian Riverina.
16. LACUSTRINE: Vegetation associated with lakes.

1 Alpine/Sub-alpine

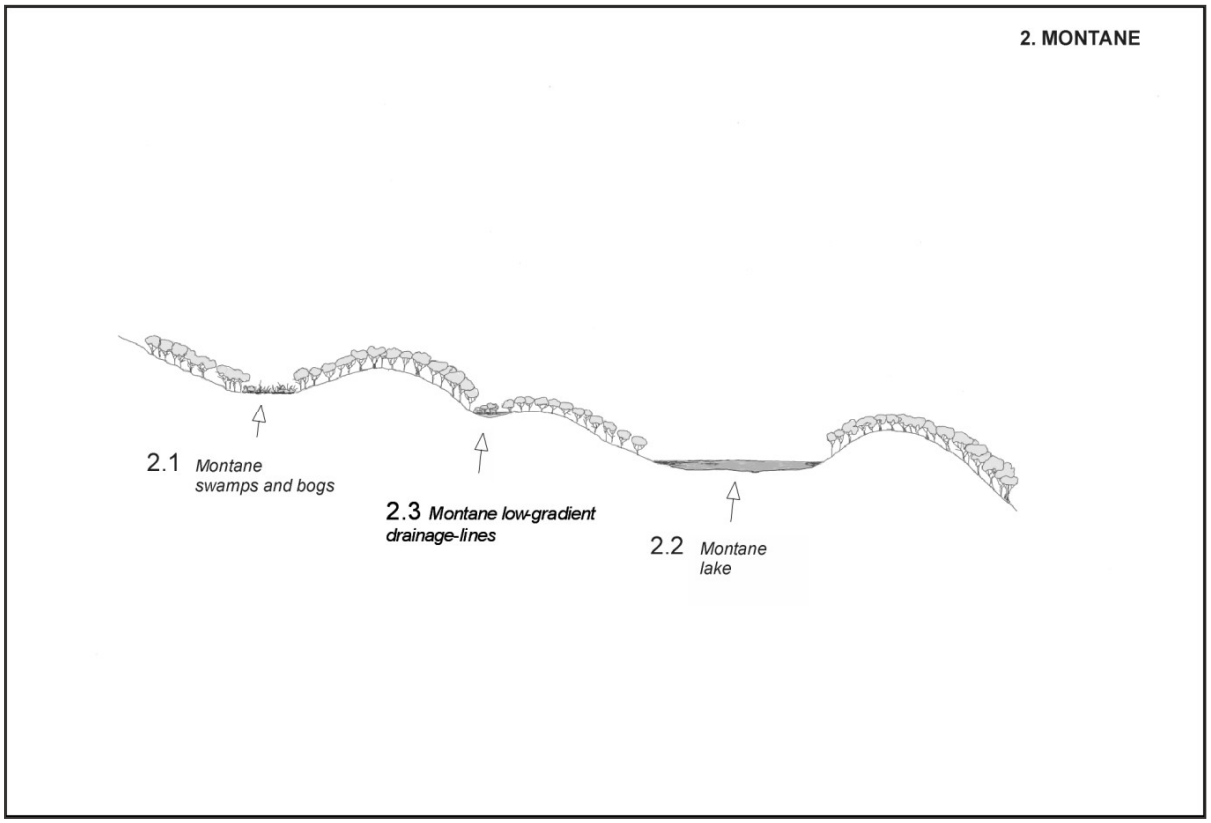
Wetlands associated with higher mountain areas of eastern Victoria, within areas subject to sustained winter snow (generally above 1200 m elevation, but sometimes extending lower with cool-air drainage).



Component	Wetland EVC
1.1 Alpine valley bog	171. Alpine Fen
	288. Alpine Heath Peatland
	1011. Alpine Hummock Peatland
1.2 Alpine snow-patch/gully head and associated soaks	239 Alpine Creekline Herbland
	288. Alpine Heath Peatland
	905. Alpine Short Herbland
	210. Sub-alpine Wet Heathland
1.3 Alpine/sub-alpine bogs and fringing communities	171. Alpine Fen
	1011. Alpine Hummock Peatland
	A130. Montane Boggy Woodland
	41. Montane Riparian Thicket
	913. Sub-alpine Pond Herbland
	210. Sub-alpine Wet Heathland
1.4 Sub-alpine wet plains	917. Sub-alpine Wet Sedgeland
1.5 Sub-alpine lakes	308. Aquatic Sedgeland
	Verge communities – see 1.3 above.

2 Montane

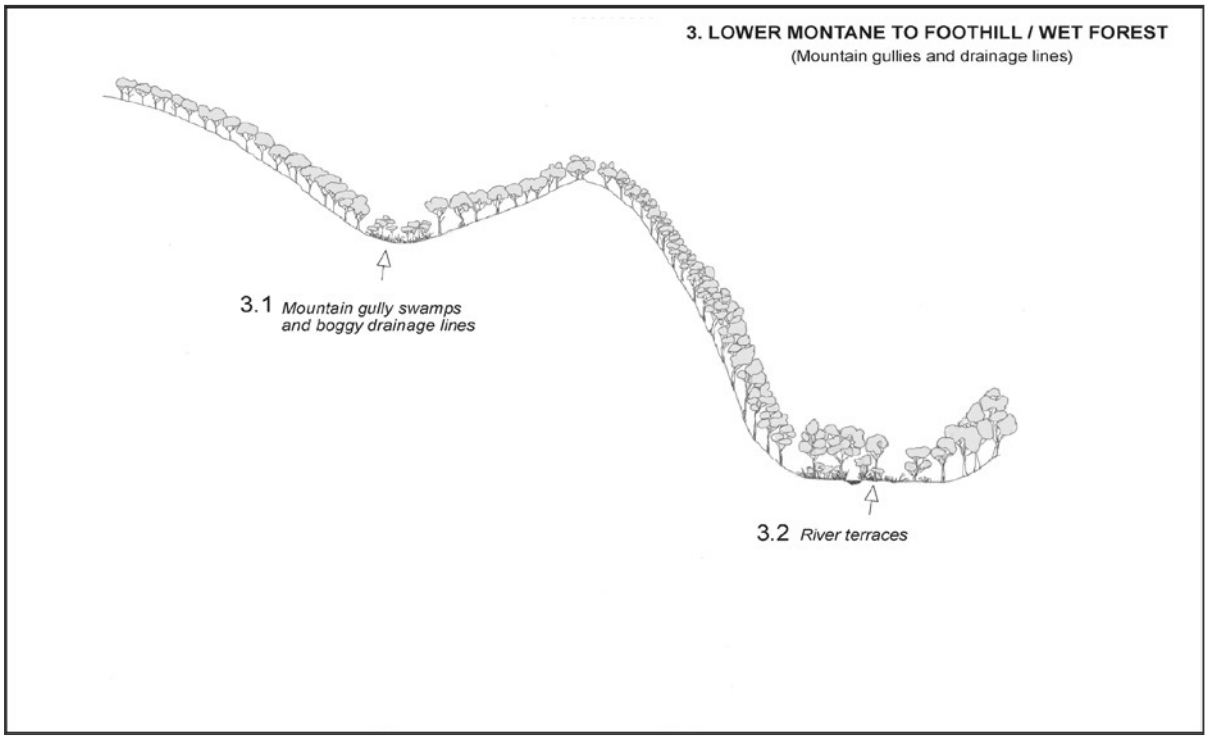
Wetlands associated with high elevation areas (generally within 700–1200 m elevation) of eastern Victoria, below the sub-alpine zone. Subject to cold-air drainage, but below the zone of sustained winter snow.



Component	Wetland EVC
2.1 Montane swamps and bogs	653. Aquatic Herbland
	308. Aquatic Sedgeland
	966. Montane Bog
	148. Montane Sedgeland
	318. Montane Swamp
	210. Sub-alpine Wet Heathland
2.2 Montane lake	767. Plains Grassy Wetland/Brackish Herbland Complex
2.3 Montane low-gradient drainage lines	A130. Montane Boggy Woodland
	41. Montane Riparian Thicket
	40. Montane Riparian Woodland
	148. Montane Sedgeland

3 Lower montane to foothill/wet forest

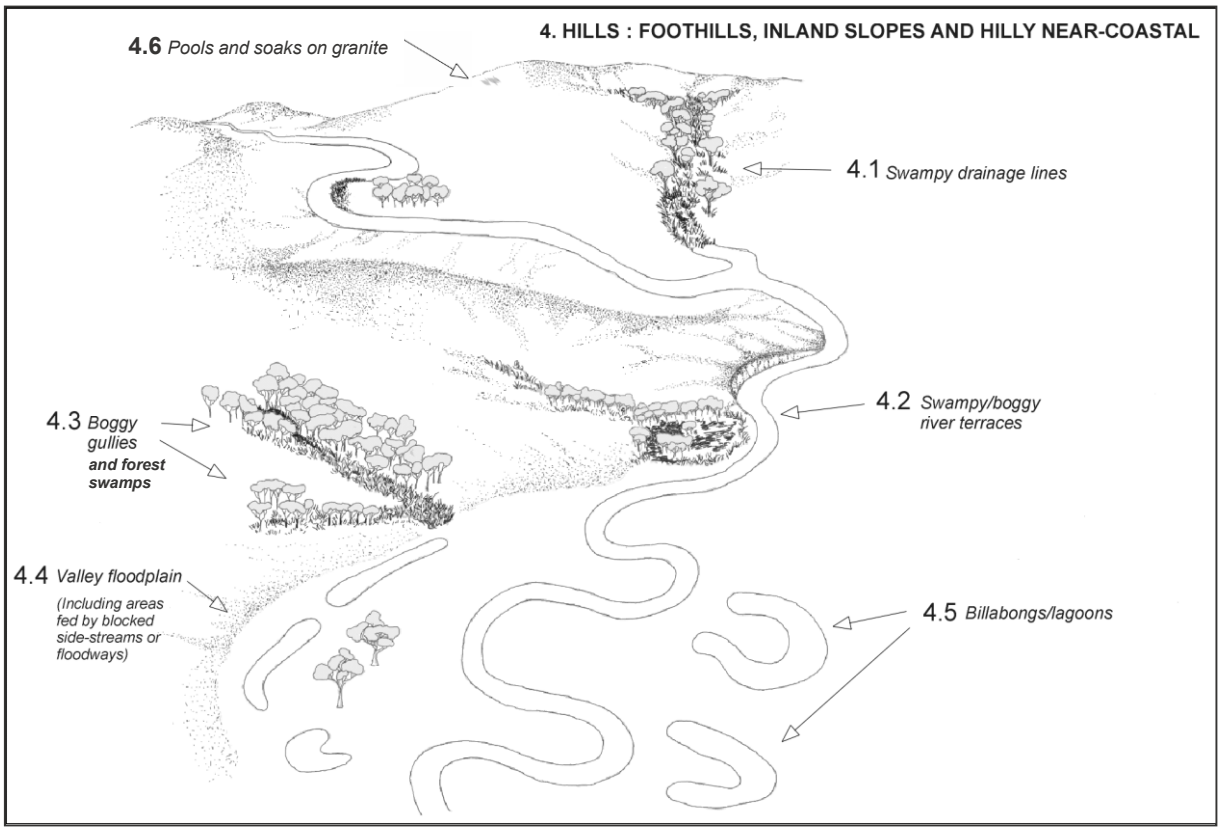
Wetlands of gullies and drainage lines within taller, denser forest country (e.g. East Gippsland, South Gippsland, Central Highlands and Otways).



Component	Wetland EVC
3.1 Mountain gully swamps and boggy drainage lines	721. Fern Swamp 728. Forest Creekline Sedge Swamp 185. Perched Boggy Shrubland Aggregate 191. Riparian Scrub 59. Riparian Thicket
3.2 River terraces	191. Riparian Scrub 83. Swampy Riparian Woodland

4 Hills: Foothills, inland slopes and hilly near-coastal

Wetlands associated with drainage lines and wet flats of at least moderate rainfall foothill country (south of divide and moister inland slopes, generally >650 mm rainfall per annum).



Component	Wetland EVC
4.1 Swampy drainage lines	728. Forest Creekline Sedge Swamp
	937. Swampy Woodland
	83. Swampy Riparian Woodland
4.2 Swampy/boggy river terraces	83. Swampy Riparian Woodland
	53. Swamp Scrub
	937. Swampy Woodland
	932. Wet Verge Sedgeland

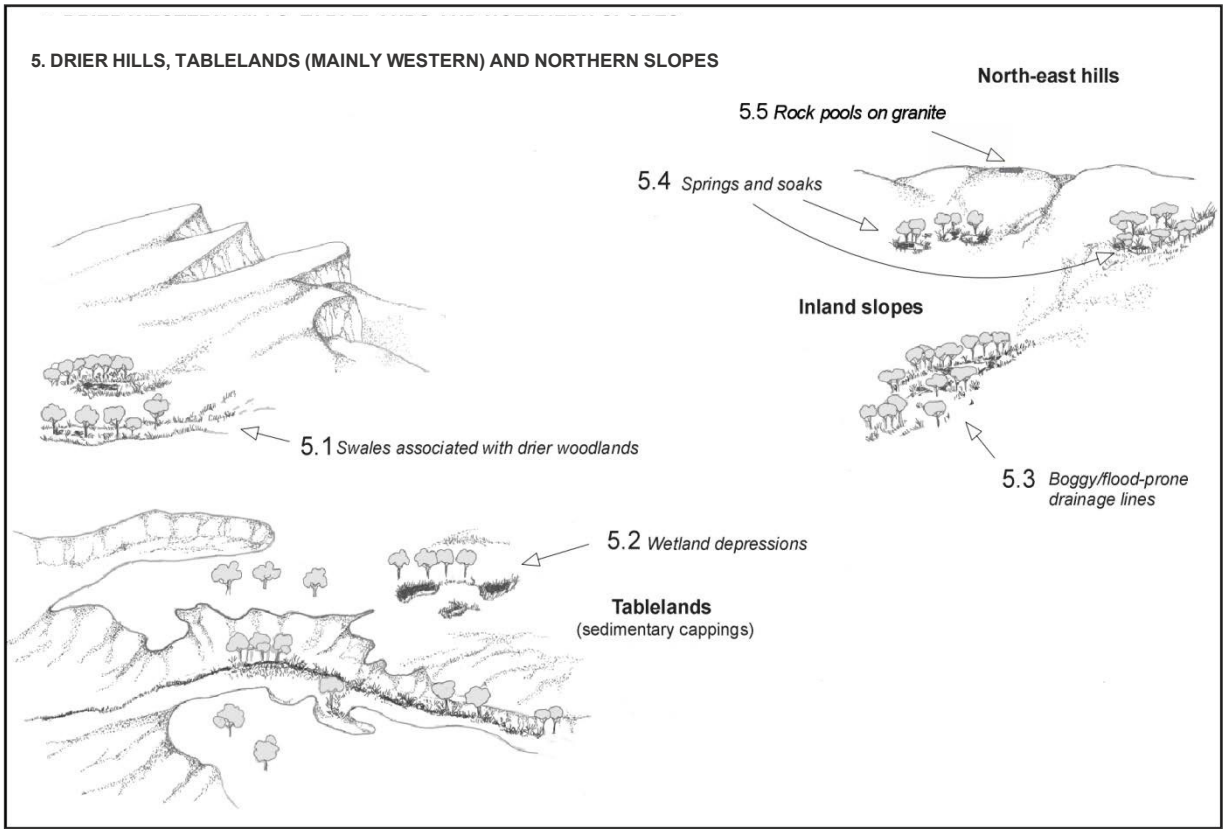
Components continued overleaf

4 Hills: Foothills, inland slopes and hilly near-coastal (continued)

Component	Wetland EVC
4.3 Boggy gullies and forest swamps	723. Forest Bog
	A129. Forest Wet Flat Herbland
	185. Perched Boggy Shrubland Aggregate
	A120. Riparian Fern Scrub
	191. Riparian Scrub
	195. Seasonally inundated Shrubby Woodland (dry north-central to south-west)
	80. Spring-soak Woodland Aggregate (dry north-east)
	49. Swamp Heathland Aggregate
	A104. Wet Heathland/Plains Grassy Wetland Complex
	A105. Wet Heathland/Plains Sedgy Wetland Complex
	56. Floodplain Riparian Woodland
	56. Floodplain Riparian Woodland/334. Billabong Wetland Aggregate
	56. Floodplain Riparian Woodland/172. Floodplain Wetland Aggregate
4.4 Valley floodplain	334. Billabong Wetland Aggregate/172. Floodplain Wetland Aggregate with potential components: 819. Spike-sedge Wetland 53. Aquatic Herbland 308. Aquatic Sedgeland 949. Dwarf Floating Aquatic Herbland 809. Floodplain Grassy Wetland 810. Floodway Pond Herbland 918. Submerged Aquatic Herbland 53. Swamp Scrub 821. Tall Marsh 990. Unvegetated 932. Wet Verge Sedgeland
	1112. Granite Rock-pool Wetland
	80. Spring-soak Woodland Aggregate
4.5 Billabongs/lagoons	185. Perched Boggy Shrubland Aggregate (far north-east)
4.6 Pools and soaks on granite	

5 Drier hills and tablelands (mainly western) and northern slopes

Wetlands associated with drainage lines, springs and soaks, swales and wet flats of lower rainfall hilly areas (specifically north-east hills, drier Midlands of north-central Victoria and the elevated plateau of the Dundas Tablelands, generally <650 mm rainfall per annum).



Component	Wetland EVC
5.1 Swales associated with drier woodlands	284. Claypan Ephemeral Wetland
	195. Seasonally Inundated Shrubby Woodland
	281. Sedge-rich Wetland
5.2 Wetland depressions	306. Aquatic Grassy Wetland
	653. Aquatic Herbland
	308. Aquatic Sedgeland
	125. Plains Grassy Wetland
	A101. Plains Grassy Wetland/Lignum Swamp Complex
	647. Plains Sedgy Wetland
	1010. Plains Sedgy Wetland/Sedge Wetland Complex
	292. Red Gum Swamp
	A115. Red Gum Swamp/Plains Rushy Wetland Complex
	963. Sedge Wetland/Aquatic Sedgeland Complex
	A118. Wet Verge Herbland

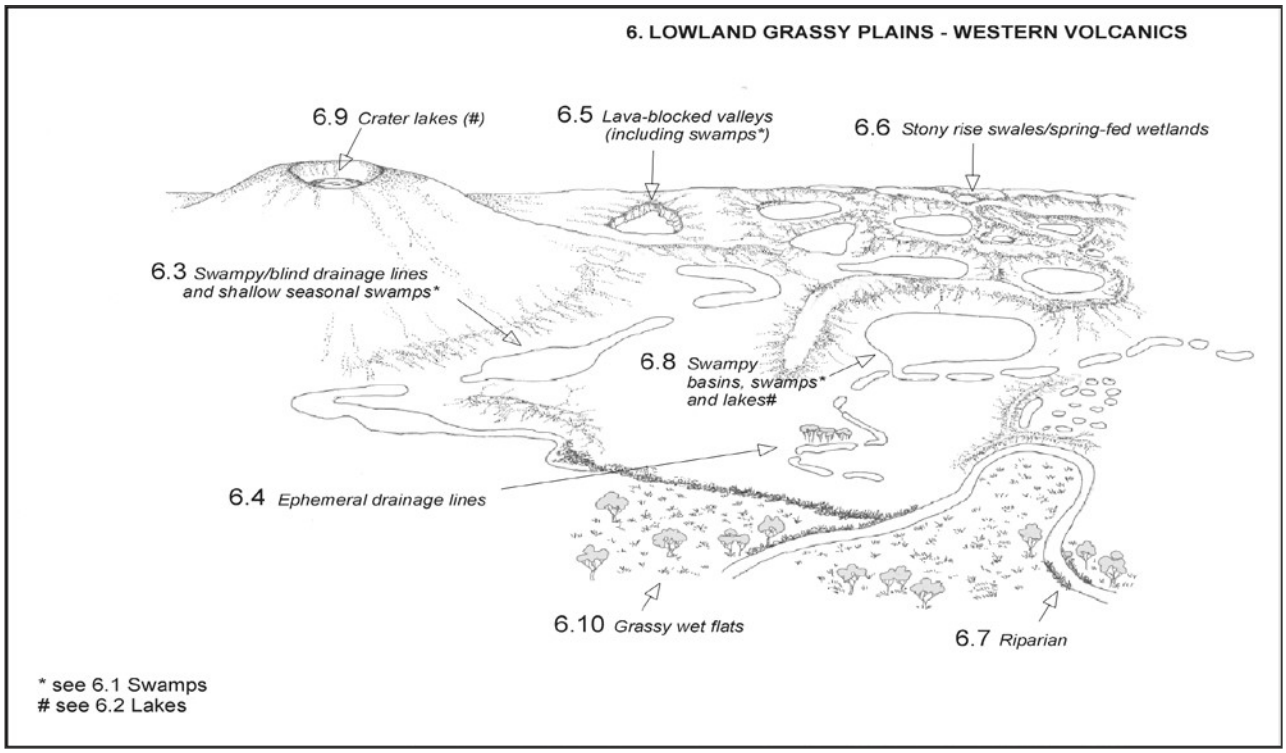
Components continued overleaf

5 Drier hills and tablelands (mainly western) and northern slopes (continued)

Component	Wetland EVC
5.3 Boggy/flood-prone drainage lines (inland slopes)	83. Swampy Riparian Woodland
	195. Seasonally Inundated Shrubby Woodland
5.4 Springs and soaks (north-east hills)	80. Spring Soak Woodland Aggregate
5.5 Rock pools on granite	1112. Granite Rock-pool Wetland

6 Lowland grassy plains – western volcanics

Wetland systems associated with basaltic terrain of (southern) western to central Victoria.



Component	Wetland EVC
6.1 Swamps	1111. Alkaline Basaltic Wetland Aggregate, components variously including: 653. Aquatic Herbland 755. Plains Grassy Wetland/Aquatic Herbland Complex 883. Sedge Wetland/Calcareous Wet Herbland Complex 821. Tall Marsh 932. Wet Verge Sedgeland 306. Aquatic Grassy Wetland 653. Aquatic Herbland 308. Aquatic Sedgeland 291. Cane Grass Wetland 104. Lignum Swamp 125. Plains Grassy Wetland 755. Plains Grassy Wetland/Aquatic Herbland Complex 960. Plains Grassy Wetland/Spike-sedge Wetland Complex A101. Plains Grassy Wetland/Lignum Swamp Complex 961. Plains Rushy Wetland (low rainfall areas) 647. Plains Sedgy Wetland 1010. Plains Sedgy Wetland/Sedge Wetland Complex 784. Plains Swampy Woodland/Lignum Swamp Complex

Components continued overleaf

6 Lowland grassy plains – western volcanics (continued)

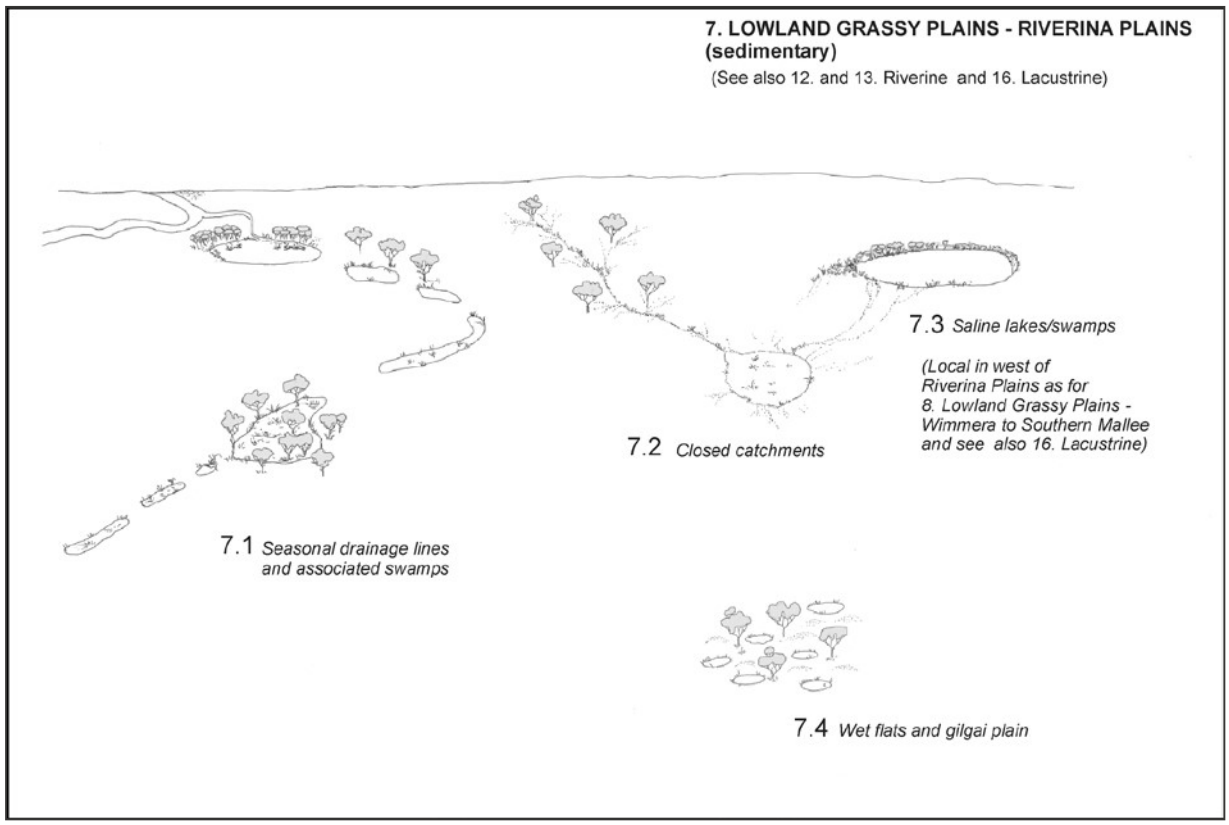
Component	Wetland EVC
6.1 Swamps (continued)	292. Red Gum Swamp (rare on basalt) A114. Red Gum Swamp/Cane Grass Wetland Complex (very rare) A115. Red Gum Swamp/Plains Rushy Wetland Complex 819. Spike-sedge Wetland 920. Sweet Grass Wetland
6.1.1 Swamps in higher rainfall areas on basalt (far southwest)	647. Plains Sedgy Wetland 651. Plains Swampy Woodland A104. Wet Heathland/Plains Grassy Wetland Complex A105. Wet Heathland/Plains Sedgy Wetland Complex
6.2 Lakes	718. Freshwater Lake Aggregate, components variously including: 306. Aquatic Grassy Wetland 653. Aquatic Herbland 308. Aquatic Sedgeland 949. Dwarf Floating Aquatic Herbland 657. Freshwater Lignum Shrubland 755. Plains Grassy Wetland/Aquatic Herbland Complex 647. Plains Sedgy Wetland 651. Plains Swampy Woodland 918. Submerged Aquatic Herbland 821. Tall Marsh 990. Unvegetated 932. Wet Verge Sedgeland 636. Brackish Lake Aggregate, components variously including: 537. Brackish Aquatic Herbland 947. Brackish Lignum Swamp 538. Brackish Herbland 656. Brackish Wetland Aggregate 657. Freshwater Lignum Shrubland 842. Saline Aquatic Meadow 918. Submerged Aquatic Herbland 821. Tall Marsh 990. Unvegetated 717. Saline Lake Aggregate, components variously including: 538. Brackish Herbland 947. Brackish Lignum Swamp 888. Plains Saltmarsh Aggregate 842. Saline Aquatic Meadow 648. Saline Lake-verge Aggregate A113. Saltmarsh-grass Swamp 964. Shell-beach Herbland (extremely localised) 990. Unvegetated

6 Lowland grassy plains – western volcanics (continued)

Component	Wetland EVC
6.3 Swampy/blind drainage lines and shallow seasonal swamps	947. Brackish Lignum Swamp
	656. Brackish Wetland Aggregate
	291. Cane Grass Wetland
	767. Plains Grassy Wetland/Brackish Herbland Complex
	959. Plains Grassy Wetland/Sedge-rich Wetland Complex
	960. Plains Grassy Wetland/Spike-sedge Wetland Complex
6.4 Ephemeral drainage lines	538. Brackish Herbland
	656. Brackish Wetland Aggregate
	678. Ephemeral Drainage-line Grassy Wetland (rainshadow areas west of Melbourne)
	124. Grey Clay Drainage-line Aggregate
	974. Lava Plain Ephemeral Wetland (very rare)
	767. Plains Grassy Wetland/Brackish Herbland Complex
	53. Swamp Scrub
6.5 Lava-blocked valleys	See 6.1 Swamps and 6.2 Lakes
6.6 Stony rise swales/spring-fed wetlands	306. Aquatic Grassy Wetland
	653. Aquatic Herbland
	538. Brackish Herbland
	949. Dwarf Floating Aquatic Herbland
	755. Plains Grassy Wetland/Aquatic Herbland Complex
	767. Plains Grassy Wetland/Brackish Herbland Complex
	647. Plains Sedgy Wetland
	857. Stony Rises Pond Aggregate
	920. Sweet-grass Wetland
	932. Wet Verge Sedgeland
6.7 Riparian	56. Floodplain Riparian Woodland
	172. Floodplain Wetland Aggregate
6.8 Swampy basins, swamps and lakes	See 6.1 Swamps and 6.2 Lakes
6.9 Crater lakes	See 6.2 Lakes
6.10 Grassy wet flats Gilgai systems occurring within the Plains Grassland/ Herb-rich Gilgai Wetland Mosaic and Plains Woodland/Herb-rich Gilgai Wetland Mosaic can be assessed using the IWC benchmark. Assessment of these mosaic EVCs as a whole should be conducted using the Habitat Hectares method.	956. Herb-rich Gilgai Wetland 125. Plains Grassy Wetland 651. Plains Swampy Woodland

7 Lowland grassy plains – Riverina plains

Wetland systems associated with sedimentary alluvial plains of northern Victoria (within basin of Murray River and tributaries, approximately east of Loddon River). See also 12. Riverine – mid-Murray for systems associated with tributaries of the Murray River.



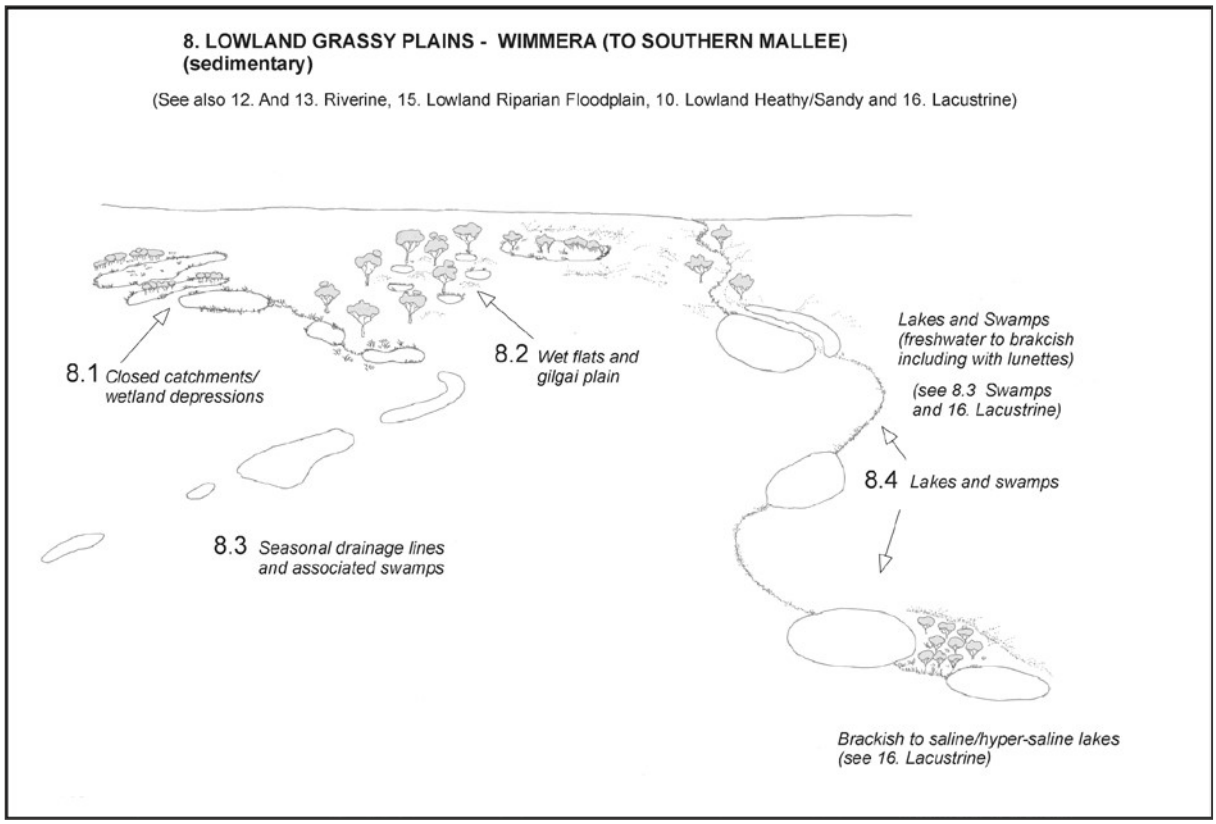
Component	Wetland EVC
7.1 Seasonal drainage lines and associated swamps	806. Alluvial Plains Semi-arid Grassland (very localised)
	A123. Alluvial Plains Semi-arid Shrubland (very localised)
	653. Aquatic Herbland
	A127. Grassy Red Gum Swamp
	813. Intermittent Swampy Woodland (very localised)
	104. Lignum Swamp
	823. Lignum Swampy Woodland
	125. Plains Grassy Wetland
	A101. Plains Grassy Wetland/Lignum Swamp Complex
	292. Red Gum Swamp
	819. Spike-sedge Wetland

7 Lowland grassy plains – Riverina Plains (continued)

Component	Wetland EVC
7.2 Closed catchments	291. Cane Grass Wetland
	104. Lignum Swamp
	961. Plains Rushy Wetland
	A101. Plains Grassy Wetland/Lignum Swamp Complex
	292. Red Gum Swamp
	A114. Red Gum Swamp/Cane Grass Wetland Complex
	A115. Red Gum Swamp/Plains Rushy Wetland Complex
	A117. Cane Grass Wetland/Alluvial Plains Semi-arid Shrubland Complex (very localised)
7.3 Saline lakes/swamps Localised, in west of Riverina: also see 8. Lowland Grassy Plains – Wimmera (to southern Mallee) and 16. Lacustrine diagrams	537. Brackish Aquatic Herbland
	538. Brackish Herbland
	636. Brackish Lake Aggregate
	539. Brackish Lake Bed Herbland
	947. Brackish Lignum Swamp
	656. Brackish Wetland Aggregate
	842. Saline Aquatic Meadow
	717. Saline Lake Aggregate
	648. Saline Lake-verge Aggregate
	101. Samphire Shrubland (mainly adventive, species-poor)
	990. Unvegetated
7.4 Wet flats and gilgai plains Gilgai systems occurring with EVC 235 Plains Woodland-Herb-rich Gilgai Wetland Mosaic can be assessed using the IWC benchmark. Assessment of the mosaic as a whole should be conducted using the Habitat Hectares method.	956. Herb-rich Gilgai Wetland
	815. Riverine Swampy Woodland
	125. Plains Grassy Wetland

8 Lowland grassy plains – Wimmera (to southern Mallee)

Wetland systems associated with inland sedimentary alluvial plains of further western to north-western Victoria (approximately west of Loddon River).



Component	Wetland EVC
8.1 Closed catchments/wetland depressions	A123. Alluvial Plains Semi-arid Shrubland (*Tall Cane Grass* community) (previously known as 808. Lignum Shrubland)
	369. Black Box Wetland
	947. Brackish Lignum Swamp
	606. Cane Grass Wetland/Brackish Herbland Complex
	104. Lignum Swamp
	125. Plains Grassy Wetland
8.2 Wet flats and gilgai plains. Gilgai systems occurring with EVC 235 Plains Woodland–Herb-rich Gilgai Wetland Mosaic can be assessed using the IWC benchmark. Assessment of the mosaic as a whole should be conducted using the Habitat Hectares method.	956. Herb-rich Gilgai Wetland
	125. Plains Grassy Wetland
	283. Plains Sedgy Woodland (also see 'Lowland Heathy/Sandy' diagram)

8 Lowland grassy plains – Wimmera (to southern Mallee) (continued)

Component	Wetland EVC
8.3 Seasonal drainage lines and associated swamps (also see 6.1 Swamps)	653. Aquatic Herbland
	291. Cane Grass Wetland
	606. Cane Grass Wetland/Brackish Herbland Complex
	954. Freshwater Lignum – Cane Grass Swamp
	104. Lignum Swamp
Components continued overleaf 8.3 Seasonal drainage lines and associated swamps (also see 6.1 Swamps) (continued)	125. Plains Grassy Wetland
	959. Plains Grassy Wetland/Sedge-rich Wetland
	960. Plains Grassy Wetland/Spike-sedge Wetland Complex
	292. Red Gum Swamp
	A114. Red Gum Swamp/Cane Grass Wetland Complex
	819. Spike-sedge Wetland
	920. Sweet Grass Wetland
8.4 Lakes and swamps. See also 8.3 Swamps and 16. Lacustrine diagrams.	718. Freshwater Lake Aggregate, components variously including: 653. Aquatic Herbland 602. Cane Grass Wetland/Aquatic Herbland Complex 949. Dwarf Floating Aquatic Herbland 954. Freshwater Lignum – Cane Grass Swamp 813. Intermittent Swampy Woodland A121. Intermittent Swampy Woodland/Floodway Pond Herbland Complex A119. Intermittent Swampy Woodland/Lake Bed Herbland Complex 107. Lake Bed Herbland 823. Lignum Swampy Woodland 814. Riverine Swamp Forest/292. Red Gum Swamp (verge communities) 918. Submerged Aquatic Herbland 821. Tall Marsh 990. Unvegetated
	636. Brackish Lake Aggregate, components variously including: 537. Brackish Aquatic Herbland 934. Brackish Grassland 538. Brackish Herbland 539. Brackish Lake Bed Herbland 947. Brackish Lignum Swamp 656. Brackish Wetland Aggregate 606. Cane Grass Wetland/Brackish Herbland Complex 990. Unvegetated

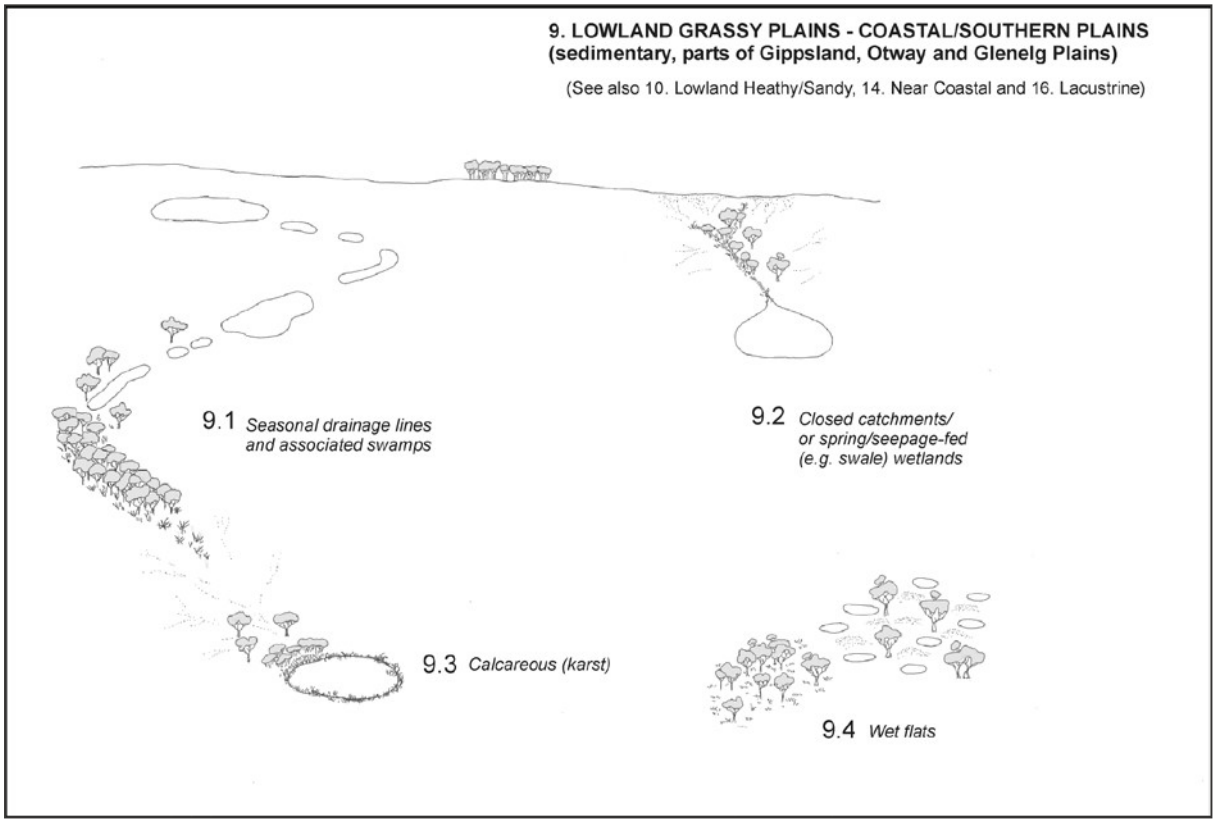
Components continued overleaf

8 Lowland grassy plains – Wimmera (to southern Mallee (continued)

Component	Wetland EVC
8.4 Lakes and swamps (continued)	717. Saline (to hypersaline) Lake Aggregate, components variously including: 934. Brackish Grassland 538. Brackish Herbland 947. Brackish Lignum Swamp 973. Brackish Shrubland 708. Hypersaline Inland Saltmarsh Aggregate 842. Saline Aquatic Meadow 648. Saline Lake-verge Aggregate 676. Salt Paperbark Woodland A113. Saltmarsh-grass Swamp 101. Samphire Shrubland 990. Unvegetated

9 Lowland grassy plains – coastal/southern plains

Wetland systems associated with relatively fertile (mostly clay) sedimentary plains south of the Divide.



Component	Wetland EVC
9.1 Seasonal drainage lines and associated swamps	653. Aquatic Herbland
	308. Aquatic Sedgeland
	125. Plains Grassy Wetland
	651. Plains Swampy Woodland
	819. Spike-sedge Wetland
	53. Swamp Scrub
	821. Tall Marsh
	932. Wet Verge Sedgeland
9.2 Closed catchments or spring/seepage-fed (e.g. swale) wetlands	306. Aquatic Grassy Wetland
	653. Aquatic Herbland
	308. Aquatic Sedgeland
	647. Plains Sedgy Wetland
	1010. Plains Sedgy Wetland/Sedge Wetland Complex
	651. Plains Swampy Woodland
	292. Red Gum Swamp

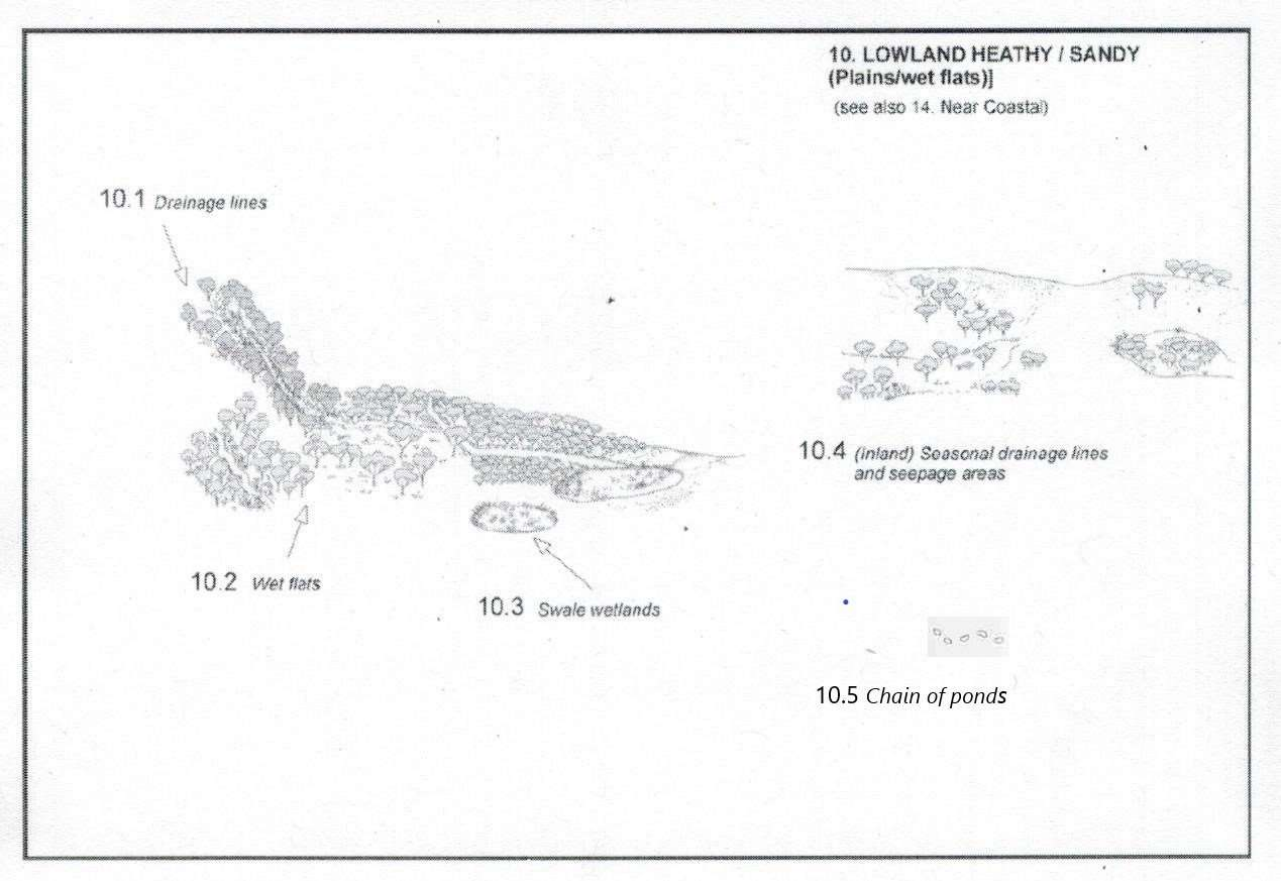
Components continued overleaf

9 Lowland grassy plains – coastal/southern plains (continued)

Component	Wetland EVC
9.3 Calcareous ('karst')	591. Calcareous Wet Herbland
	958. Plains Grassy Wetland/Calcareous Wet Herbland Complex
	136. Sedge Wetland
	883. Sedge Wetland/Calcareous Wet Herbland Complex
	908. Sink-hole Wetland Aggregate
	53. Swamp Scrub (calcareous community)
	2004. Swamp Scrub/Gahnia Sedgeland Complex (calcareous community)
	990. Unvegetated
9.4 Wet flats	976. Coastal Ephemeral Wetland
	125. Plains Grassy Wetland
	651. Plains Swampy Woodland

10 Lowland heathy/sandy

Wetland systems associated with relatively less fertile (mostly acidic sandy) sedimentary soils (e.g. sand sheets and dune swales), mostly south of the Divide but extending inland in south-west Victoria (e.g. Grampians, Little Desert) and occasional foothill elevations (e.g. Dereel, northern Brisbane Ranges).



Component	Wetland EVC
10.1 Drainage lines	A120. Riparian Fern Scrub
	191. Riparian Scrub
	53. Swamp Scrub
	49. Swamp Heathland Aggregate
10.2 Wet flats	13. Brackish Sedgeland (very localised)
	707. Sedgy Swamp Woodland (rare)
	937. Swampy Woodland
	53. Swamp Scrub
	8. Wet Heathland
	931. Wet Heathland/Sedge Wetland Complex
	A104. Wet Heathland/Plains Grassy Wetland complex
	A105. Wet Heathland/Plains Sedgy Wetland Complex

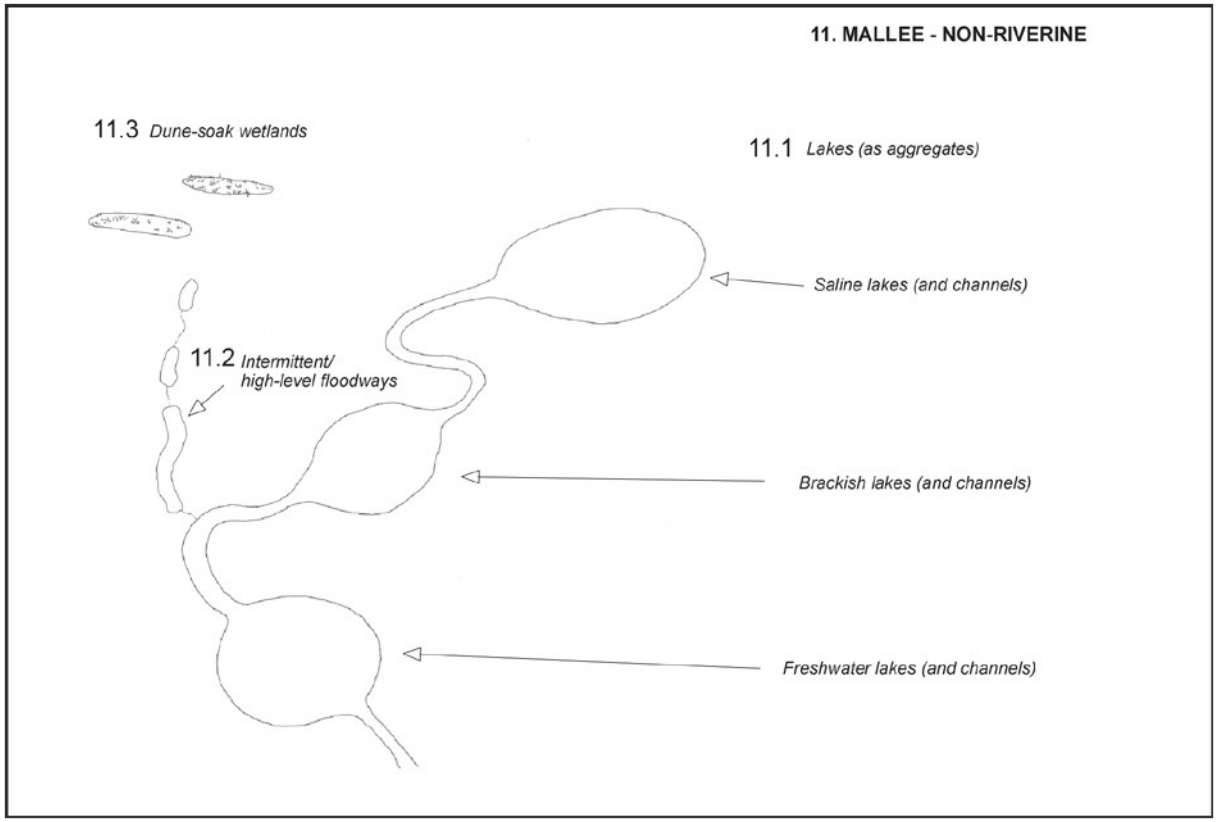
Components continued overleaf

10 Lowland heathy/sandy (continued)

Component	Wetland EVC
10.3 Swale wetlands	653. Aquatic Herbland
	308. Aquatic Sedgeland
	723. Forest Bog
	1010. Plains Sedgy Wetland/Sedge Wetland Complex
	136. Sedge Wetland
	A102. Sedge Wetland/Aquatic Herbland complex
	963. Sedge Wetland/Aquatic Sedgeland Complex
	707. Sedgy Swamp Woodland (rare)
	A118. Wet Verge Herbland
10.4 (Inland) Seasonal drainage lines and seepage areas	973. Brackish Shrubland
	673. Dune-soak Woodland
	195. Seasonally Inundated Shrubby Woodland
	937. Swampy Woodland (very rare, Gippsland)
10.5 Chain of Ponds	A124. Sandy Stream Pond Aggregate, components variously including: 306, Aquatic Grassy Wetland 652. Aquatic Herbland 308. Aquatic Sedgeland 949. Dwarf Floating Aquatic Herbland 918. Submerged Aquatic Herbland (extremely localised) 920. Sweet Grass Wetland 821. Tall Marsh A118. Wet Verge Herbland A125. Wet Verge Herbland/Floodway Pond Herbland Complex 932. Wet Verge Sedgeland A126. Wet Verge Sedgeland/Sedge Wetland Complex

11 Mallee – non-riverine

Wetlands associated with mallee country of further north-west Victoria.



Component	Wetland EVC
11.1 Lakes (and associated channels) as aggregates See also 'Lacustrine', diagram 16	718. Freshwater Lake Aggregate, components variously including: 653. Aquatic Herbland (riverine/artificial only) 813. Intermittent Swampy Woodland A119. Intermittent Swampy Woodland/Lake Bed Herbland Complex 107. Lake Bed Herbland 103. Riverine Chenopod Woodland 821. Tall Marsh 990. Unvegetated

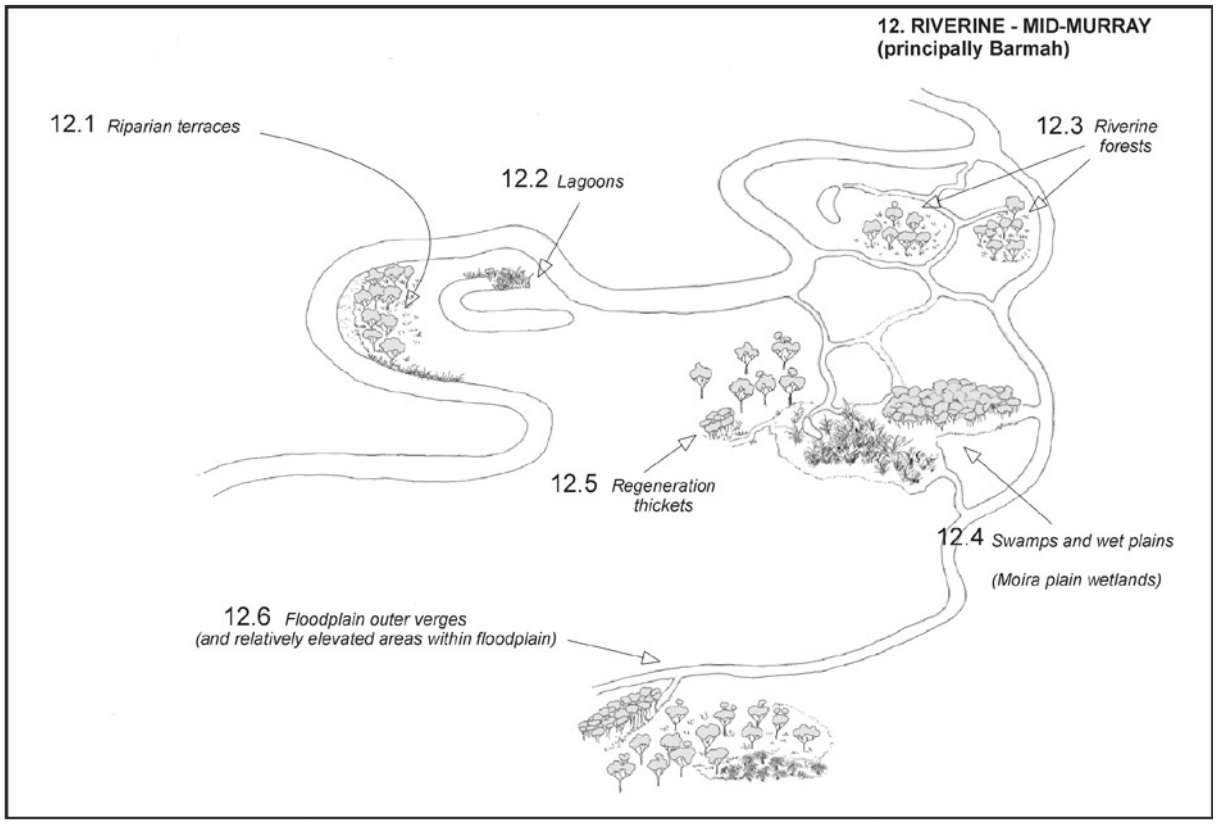
Components continued overleaf

11 Mallee - non-riverine (continued)

Component	Wetland EVC
11.1 Lakes (and associated channels) as aggregates (continued)	636. Brackish Lake Aggregate, components variously including: A123. Alluvial Plains Semi-arid Shrubland (previously known as 808. Lignum Shrubland) 539. Brackish Lake Bed Herbland 104. Lignum Swamp 823. Lignum Swampy Woodland 842. Saline Aquatic Meadow 990. Unvegetated (outer verges can be as for 718. Freshwater Lake Aggregate)
	636. Saline (to hypersaline) Lake Aggregate, components variously including: 708. Hypersaline Inland Saltmarsh Aggregate 842. Saline Aquatic Meadow 676. Salt Paperbark Woodland 101. Samphire Shrubland (and grades into 102. Low Chenopod Shrubland) 990. Unvegetated
11.2 Intermittent/high-level floodways	820. Sub-saline Depression Shrubland
11.3 Dune-soak wetlands Very rare in flats/swales/soaks or ephemeral ponds. In general, the Mallee lacks wetlands with local catchments. Wet flats habitat mostly supports, e.g. 95. Red Swale Mallee, 102. Low Chenopod Shrubland or grassy communities on the fringes to 101. Samphire Shrubland.	A123. Alluvial Plains Semi-arid Shrubland (*Tall Cane Grass* community) (previously known as 808. Lignum Shrubland) A128. Riverine Claypan Herbland

12 Riverine – mid-Murray

Wetlands associated with the riverine floodplain of the Murray River and tributaries (approximately upstream of Kerang).



Component	Wetland EVC
12.1 Riparian terraces	334. Billabong Wetland Aggregate
	56. Floodplain Riparian Woodland
	172. Floodplain Wetland Aggregate
	106. Grassy Riverine Forest
	811. Grassy Riverine Forest/Floodway Pond Herbland Complex
	812. Grassy Riverine Forest/Riverine Swamp Forest Complex
	813. Intermittent Swampy Woodland (very minor)
	975. Riverine Ephemeral Wetland (very rare)
	816. Sedgy Riverine Forest
	817. Sedgy Riverine Forest/Riverine Swamp Forest Complex

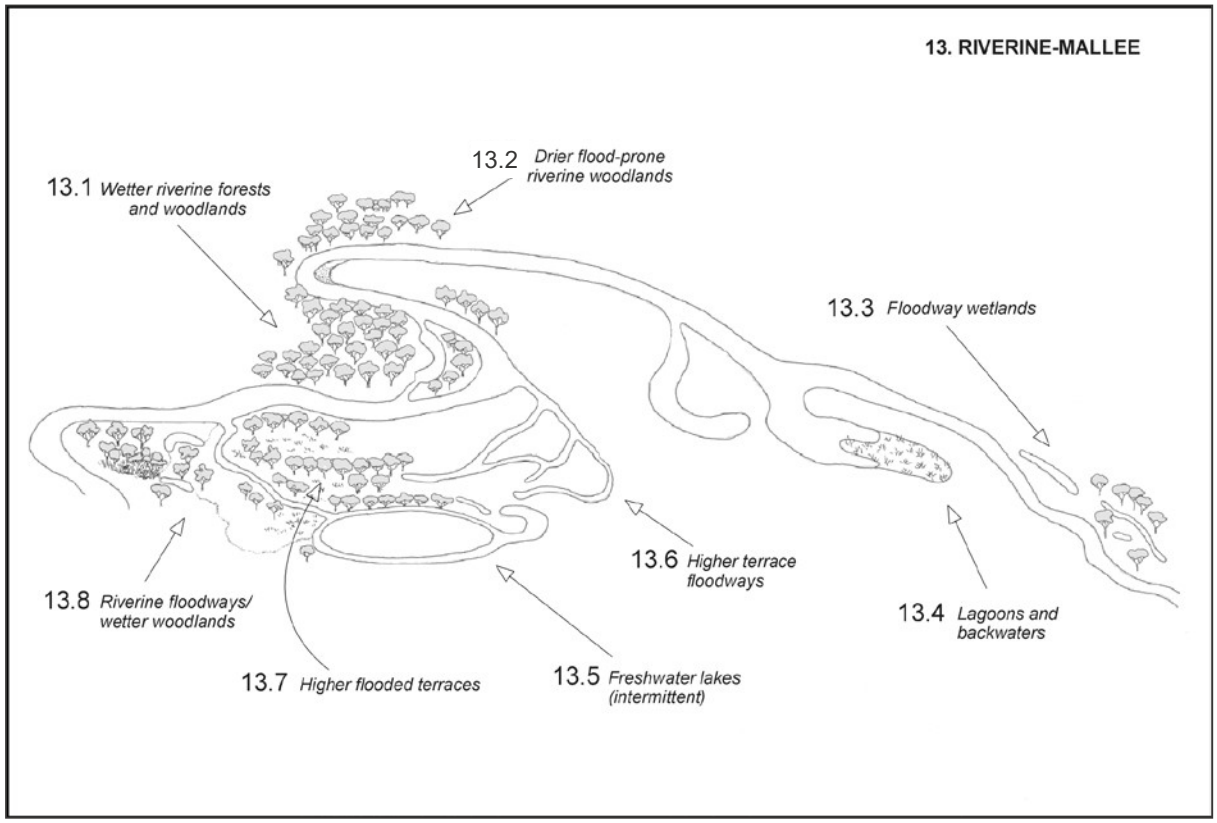
Components continued overleaf

12 Riverine – mid-Murray (continued)

Component	Wetland EVC
12.2 Lagoons	334. Billabong Wetland Aggregate, components variously including: 653. Aquatic Herbland 949. Dwarf Floating Aquatic Herbland 810. Floodway Pond Herbland 918. Submerged Aquatic Herbland 821. Tall Marsh 990. Unvegetated
12.3 Riverine forests	106. Grassy Riverine Forest
	812. Grassy Riverine Forest/Riverine Swamp Forest Complex
	816. Sedgy Riverine Forest
	817. Sedgy Riverine Forest/Riverine Swamp Forest Complex
12.4 Swamps and wet plains (Moira plain wetlands	653. Aquatic Herbland
	809. Floodplain Grassy Wetland
	810. Floodway Pond Herbland
	945. Floodway Pond Herbland/Riverine Swamp Forest Complex
	814. Riverine Swamp Forest
	804. Rushy Riverine Swamp Aggregate
	819. Spike-sedge Wetland
	821. Tall Marsh
12.5 Regeneration thickets	Juvenile:
	814. Riverine Swamp Forest; and
	945. Floodway Pond Herbland/Riverine Swamp Forest Complex
12.6 Floodplain outer verges (and relatively elevated areas within floodplain)	A128. Riverine Claypan Herbland (extremely localised)
	103. Riverine Chenopod Woodland (marginal, eastern end of distribution)
	815. Riverine Swampy Woodland

13 Riverine–Mallee

Wetlands associated with the riverine floodplain of the Murray River and tributaries (approximately downstream of Kerang).



Component	Wetland EVC
13.1 Wetter riverine forests and woodlands	106. Grassy Riverine Forest
	811. Grassy Riverine Forest/Floodway Pond Herbland Complex
	812. Grassy Riverine Forest/Riverine Swamp Forest Complex
	814. Riverine Swamp Forest (minor and mainly within complexes)
13.2 Drier flood-prone riverine woodlands	813. Intermittent Swampy Woodland/Riverine Grassy Woodland Complex
	103. Riverine Chenopod Woodland
13.3 Floodway wetlands	809. Floodplain Grassy Wetland
	810 Floodway Pond Herbland
	945. Floodway Pond Herbland/Riverine Swamp Forest Complex
	A122. Lake Bed Herbland/Floodway Pond Herbland Complex
	819. Spike-sedge Wetland

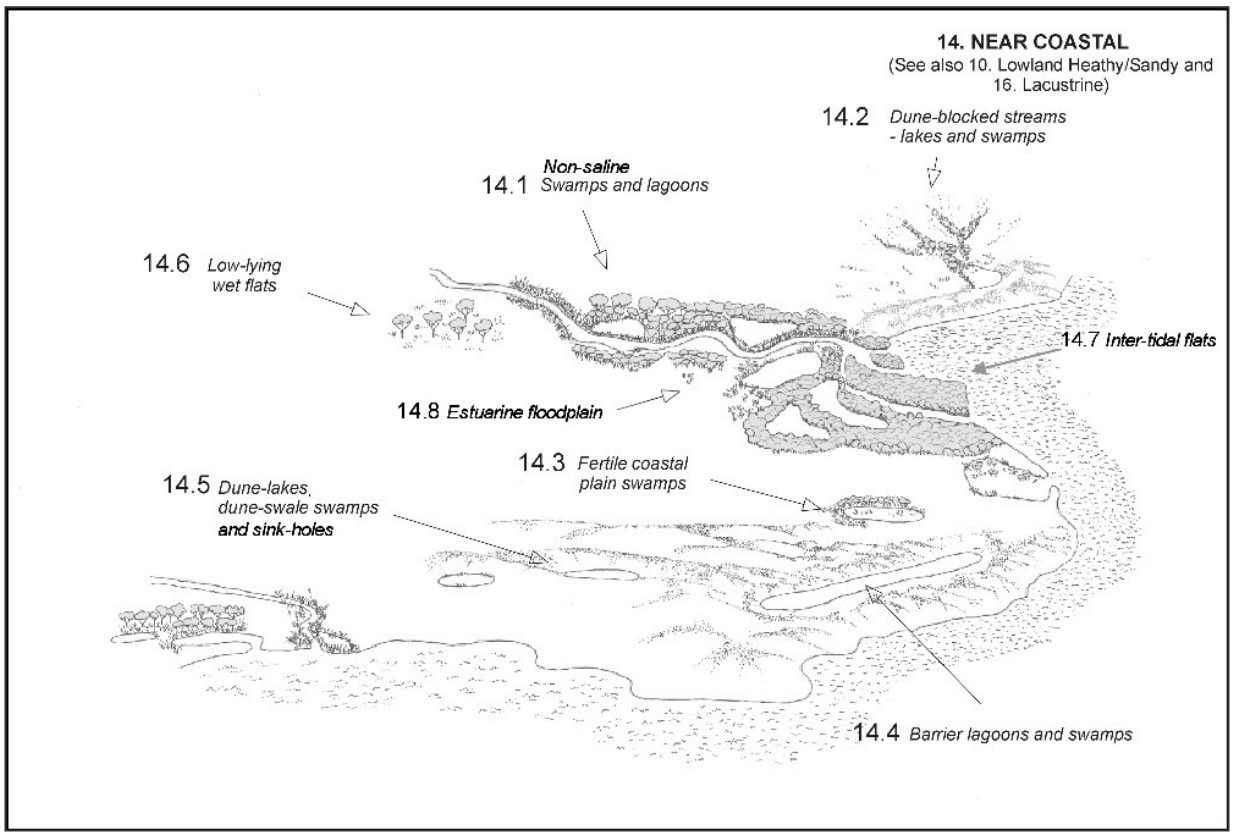
Components continued overleaf

13 Riverine – Mallee (continued)

Component	Wetland EVC
13.4 Lagoons and backwaters	653. Aquatic Herbland
	334. Billabong Wetland Aggregate
	918. Submerged Aquatic Herbland
	821. Tall Marsh
	990. Unvegetated
13.5 Freshwater lakes (intermittent)	718. Freshwater Lake Aggregate
	813. Intermittent Swampy Woodland
	A119. Intermittent Swampy Woodland/Lake Bed Herbland Complex
	107. Lake Bed Herbland or 990. Unvegetated
	104. Lignum Swamp
	823. Lignum Swampy Woodland
	103. Riverine Chenopod Woodland (verges)
	101. Samphire Shrubland (adventive in salinised areas)
	990. Unvegetated
13.6 Higher terrace floodways	104. Lignum Swamp
	A128. Riverine Claypan Herbland
	820. Sub-saline Depression Shrubland
13.7 Higher flooded terraces	806. Alluvial Plains Semi-arid Grassland
	A123. Alluvial Plains Semi-arid Shrubland (previously known as 808. Lignum Shrubland)
	104. Lignum Swamp (minor)
	103. Riverine Chenopod Woodland
13.8 Riverine floodways/wetter woodlands	A123. Alluvial Plains Semi-arid Shrubland (previously known as 808. Lignum Shrubland)
	810. Floodway Pond Herbland
	813. Intermittent Swampy Woodland
	A121. Intermittent Swampy Woodland/Floodway Pond Herbland Complex
	822. Intermittent Swampy Woodland/Riverine Grassy Woodland Complex
	A122. Lake Bed Herbland/Floodway Pond Herbland Complex
	104. Lignum Swamp
	823. Lignum Swampy Woodland

14 Near coastal

Wetlands associated with near-coastal situations (especially calcareous dune systems and blocked drainage lines), also wetlands with tidal or estuarine influences.



Component	Wetland EVC
14.1 Non-saline swamps and lagoons	653. Aquatic Herbland
	308. Aquatic Sedgeland
	810. Floodway Pond Herbland
	968. Gahnia Sedgeland
	819. Spike-sedge Wetland
	53. Swamp Scrub
	821. Tall Marsh
	990. Unvegetated (open water)
	A116. Wet Sedgy Herbland (very rare)
	A118. Wet Verge Herbland
14.2 Dune-blocked streams – lakes and swamps	653. Aquatic Herbland
	308. Aquatic Sedgeland
	875. Blocked Coastal Stream Swamp
	538. Brackish Herbland

Components continued overleaf

14 Near-coastal (continued)

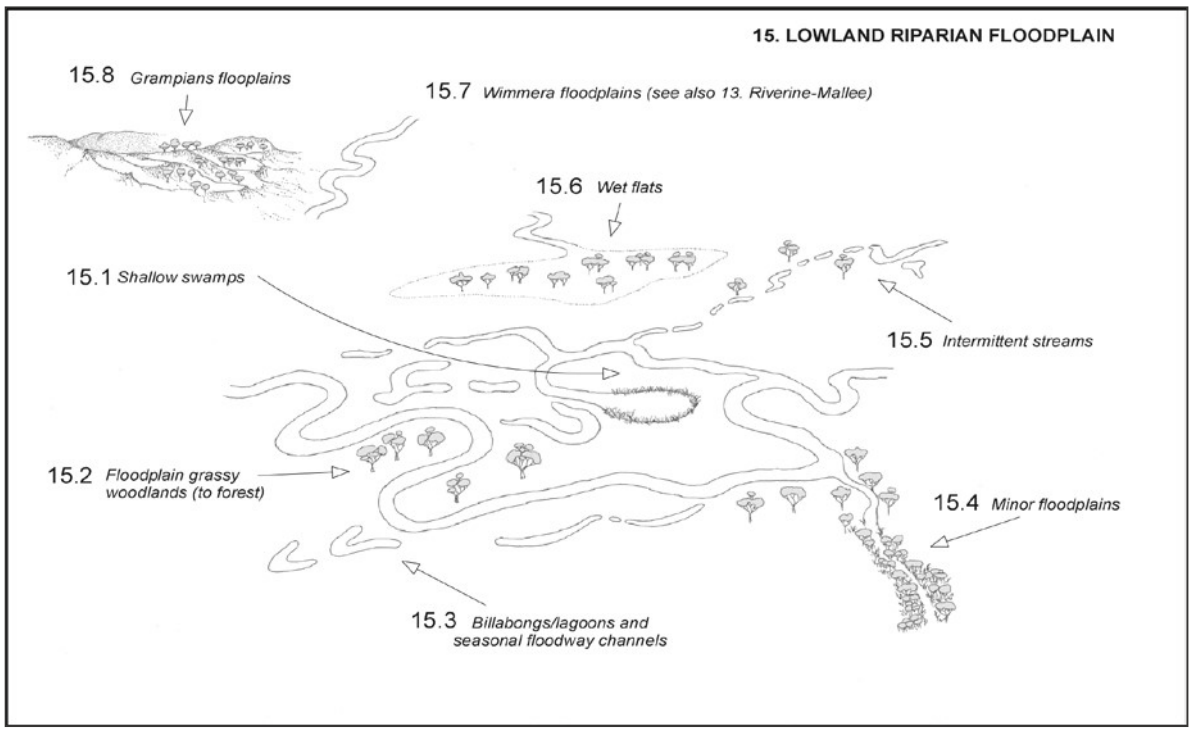
Component	Wetland EVC
14.2 Dune-blocked streams – lakes and swamps (continued)	13. Brackish Sedgeland
	11. Coastal Lagoon Wetland Aggregate
	968. Gahnia Sedgeland
	53. Swamp Scrub
	821. Tall Marsh
	990. Unvegetated
14.3 Fertile coastal plain swamps	653. Aquatic Herbland
	308. Aquatic Sedgeland
	538. Brackish Herbland
	591. Calcareous Wet Herbland
	125. Plains Grassy Wetland (minor)
	647. Plains Sedgy Wetland
	1010. Plains Sedgy Wetland/Sedge Wetland Complex
	136. Sedge Wetland
	1113. Sedge Wetland/Brackish Herbland Complex
	53. Swamp Scrub
	990. Unvegetated
14.4 Barrier lagoons and swamps	306. Aquatic Grassy Wetland (rare)
	653. Aquatic Herbland
	537. Brackish Aquatic Herbland
	538. Brackish Herbland
	656. Brackish Wetland Aggregate
	A106. Calcareous Sedgy Shrubland (rare)
	11. Coastal Lagoon Wetland Aggregate
	914. Estuarine Flats Grassland
	968. Gahnia Sedgeland
	842. Saline Aquatic Meadow
	53. Swamp Scrub
	2004. Swamp Scrub/Gahnia Sedgeland Complex
	990. Unvegetated
	12. Wet Swale Herbland
	932. Wet Verge Sedgeland

14 Near-coastal (continued)

Component	Wetland EVC
14.5 Dune-lakes, dune-swale swamps and sink-holes	538. Brackish Herbland
	656. Brackish Wetland Aggregate
	908. Sink-hole Wetland Aggregate
	990. Unvegetated
	12. Wet Swale Herbland
14.6 Low-lying wet flats	1114. Brackish Sedgy Shrubland (rare)
	976. Coastal Ephemeral Wetland
	53. Swamp Scrub
	937. Swampy Woodland
	8. Wet Heathland
Inter-tidal flats (extending to spring-tide zone) *Note: generally not covered by the IWC unless a remnant that is no longer tidally inundated	9. Coastal Saltmarsh Aggregate*
	140. Mangrove Shrubland
	842. Saline Aquatic Meadow
	845. Sea-grass Meadow
	196. Seasonally Inundated Sub-saline Herbland
	990. Unvegetated
* A107–A113 represent resolution of the potential components of EVC 9 Coastal Saltmarsh Aggregate. These are presented in more detail in the recently completed 'Victorian Saltmarsh Study 2010' (Victorian Saltmarsh Study Group 2010). Of these, only A113 is recognised as having occurrences outside coastal saltmarsh habitats.	A107. Wet Saltmarsh Herbland
	A108. Wet Saltmarsh Shrubland
	A109. Coastal Saline Grassland
	A110. Coastal Dry Saltmarsh
	A111. Coastal Hypersaline Saltmarsh
	A112. Coastal Tussock Saltmarsh
	A113. Saltmarsh-grass Swamp (rare)
14.8 Estuarine floodplain	537. Brackish Aquatic Herbland
	934. Brackish Grassland
	538. Brackish Herbland
	539. Brackish Lake Bed Herbland
	13. Brackish Sedgeland
	656. Brackish Wetland Aggregate
	914. Estuarine Flats Grassland
	952. Estuarine Reedbed
	953. Estuarine Scrub
	10. Estuarine Wetland
	842. Saline Aquatic Meadow
	990. Unvegetated

15 Lowland riparian floodplain

Wetlands associated with floodplains of major streams outside of the Victorian Riverina.



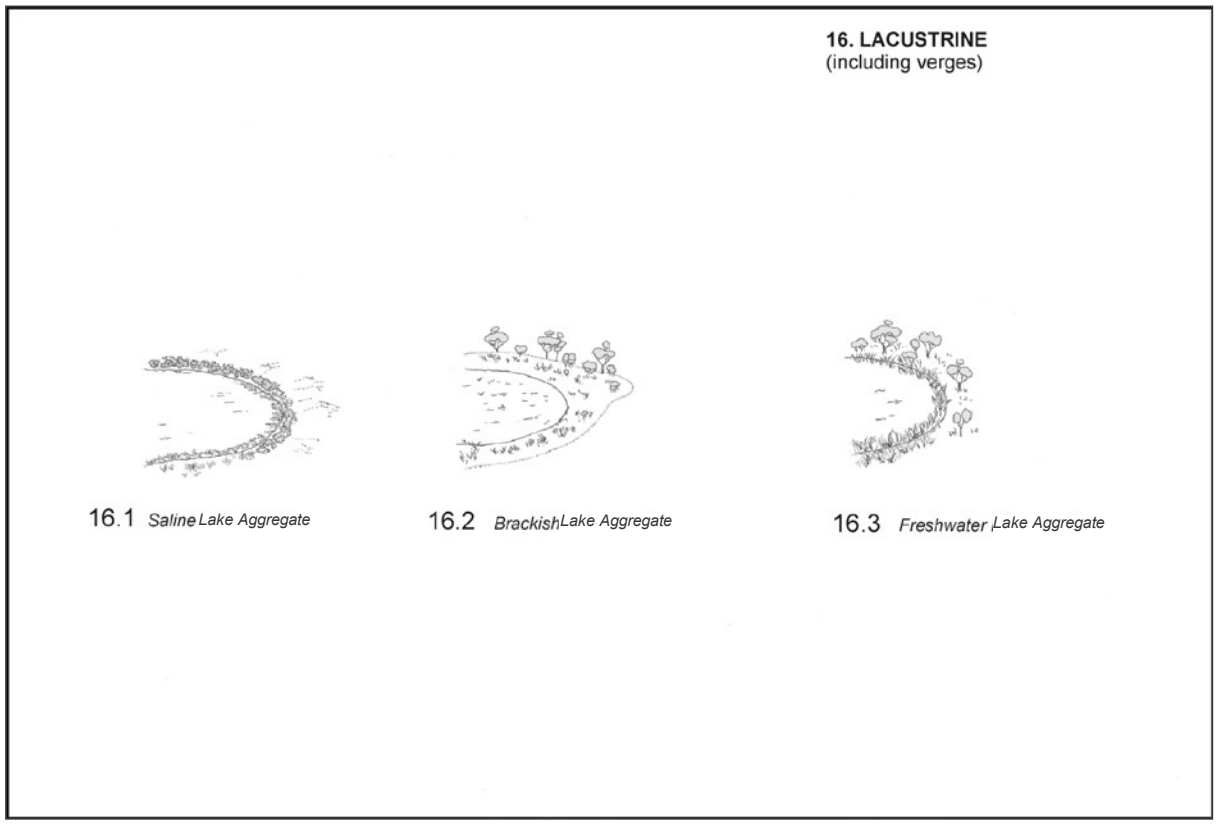
Component	Wetland EVC
15.1 Shallow swamps	172. Floodplain Wetland Aggregate, components variously including: 653. Aquatic Herbland 308. Aquatic Sedgeland 53. Swamp Scrub 937. Swampy Woodland 821. Tall Marsh 932. Wet Verge Sedgeland 809. Floodplain Grassy Wetland 125. Plains Grassy Wetland 809. Spike-sedge Wetland
15.2 Floodplain grassy woodlands (to forest)	56. Floodplain Riparian Woodland, including in mosaic with: 334. Billabong Wetland Aggregate 172. Floodplain Wetland Aggregate
15.3 Billabongs/lagoons and seasonal floodway channels	334. Billabong Wetland Aggregate or 172. Floodplain Wetland Aggregate with various components as follows: 653. Aquatic Herbland 308. Aquatic Sedgeland 949. Dwarf Floating Aquatic Herbland 810. Floodway Pond Herbland 918. Submerged Aquatic Herbland 821. Tall Marsh 990. Unvegetated 932. Wet Verge Sedgeland

15 Lowland riparian floodplain (continued)

Component	Wetland EVC
15.4 Minor floodplains	83. Swampy Riparian Woodland
15.5 Intermittent streams	53. Swamp Scrub
15.6 Wet flats	53. Swamp Scrub
	937. Swampy Woodland
15.7 Wimmera floodplains (see also 13. Riverine–Mallee diagrams)	292. Red Gum Swamp
15.8 Grampians floodplains	280. Floodplain Thicket

16 Lacustrine

Vegetation associated with lakes.



Component	Wetland EVC
16.1 Saline Lake Aggregate	538. Brackish Herbland
	888. Plains Saltmarsh Aggregate
	842. Saline Aquatic Meadow or 990. Unvegetated (open water/bare soil/mud)
	648. Saline Lake-verge Aggregate
	A113. Saltmarsh-grass Swamp
	676. Salt Paperbark Woodland (localised – Wimmera, north-west Victoria)
	101. Samphire Shrubland
	964. Shell-beach Herbland (volcanic plains, very rare)
	990. Unvegetated
16.2 Brackish Lake Aggregate	537. Brackish Aquatic Herbland or 990. Unvegetated (open water/bare soil/mud)
	538. Brackish Herbland
	539. Brackish Lake Bed Herbland (mostly drier north)
	947. Brackish Lignum Swamp
	13. Brackish Sedgeland 656. Brackish Wetland Aggregate
	606. Cane Grass Wetland/Brackish Herbland Complex
	813. Intermittent Swampy Woodland
Component continued overleaf	104. Lignum Swamp

Component	Wetland EVC
	823. Lignum Swampy Woodland
	842. Saline Aquatic Meadow
	918. Submerged Aquatic Herbland
	990. Unvegetated
16.3 Freshwater Lake Aggregate	806. Alluvial Plains Semi-arid Grassland (Mallee)
	653. Aquatic Herbland
	308. Aquatic Sedgeland
	334. Billabong Wetland Aggregate
	291. Cane Grass Wetland
	602. Cane Grass Wetland/Aquatic Herbland Complex
	11. Coastal Lagoon Wetland Aggregate
	949. Dwarf Floating Aquatic Herbland
	809. Floodplain Grassy Wetland (minor)
	810. Floodway Pond Herbland
	107. Lake Bed Herbland (Mallee)
	755. Plains Grassy Wetland/Aquatic Herbland Complex
	767. Plains Grassy Wetland/Brackish Herbland Complex
	647. Plains Sedgy Wetland
	963. Sedge Wetland/Aquatic Sedgeland Complex
	819. Spike-sedge Wetland
	857. Stony Rises Pond Aggregate
	918. Submerged Aquatic Herbland
	920. Sweet Grass Wetland
	821. Tall Marsh (including non-saline variants of Reed Swamp)
	990. Unvegetated
	932. Wet Verge Sedgeland
	Wooded verges—e.g. variously:
	813. Intermittent Swampy Woodland
	A119. Intermittent Swampy Woodland/Lake Bed Herbland Complex
	651. Plains Swampy Woodland
	292. Red Gum Swamp
	103. Riverine Chenopod Woodland
	814. Riverine Swamp Forest
	195. Seasonally inundated Shrubby Woodland
	53. Swamp Scrub
	937. Swampy Woodland

Appendix 3 IWC field assessment sheets (overleaf)

IWC assessment field sheets – August 2022

Refer to the IWC Assessment Procedure for guidance on completing the assessment. Complete all steps and fields (note Steps 3–7 involve preparing for the assessment and are not on this field sheet. Circle the appropriate score and clearly write the score in the boxes provided.

Project details

Project Name (e.g. WGCMA Wetland Tender 2012) _____

Assessors' details (record details for all assessors)

Assessor 1 details

Name _____
Phone _____
Agency _____

Assessor 2 details

Name: _____
Phone: _____
Agency: _____

Date/Time

Date: _ _/_ _/_ _ _ _
Time started: _ _:_ _
Time finished: _ _:_ _

Date of IWC training (month/year) _ _/_ _ _ _
Has required EVC assessment skills? Yes | No (circle)

Date of IWC training _ _/_ _ _ _
Has required EVC assessment skills? Yes | No (circle)

(Note: Two assessors may be needed to meet the OH&S requirements of the organisation coordinating the assessment.)

General information (IWC Assessment Procedure Step 1)

Is the wetland listed on either the WETLAND_PRE_EUROPEAN or WETLAND_CURRENT inventories? Yes | No (circle)
If 'Yes', enter wetland details below. If 'No', go to **New Wetland** below.
Wetland Identifier: (from inventory) : _____
Official wetland name (on Vicnames): _____
Local name (if different): _____

Support and Feedback
Email:
IWC.support@delwp.vic.gov.au

New Wetland
Wetland Coordinates
Coordinate system used: VicGrid94 | GDA94 coordinates (circle)
Zone (MGA):____Easting:_____Northing: _____
Official wetland name (on Vicnames): _____
Local name (if different): _____

Assessment area (IWC Assessment Procedure Step 2)

Is the whole wetland to be assessed? Yes | No (circle)
If 'No', designate and record the sampling plot ID, the area of the plot, and mark the location of the plot on Base map.
Sampling plot ID_____Area of the plot_____ (ha)
Select coordinate system and enter coordinates for the centre of the sampling plot:
Coordinate system used: VicGrid94 |MGA (circle)
Zone (MGA only):_____Easting:_____Northing: _____

Inundation status of wetland (IWC Assessment Procedure Step 8)

Wetness	% of wetland	Wetland phase	Mark with an x	Number of years dry (only if wetland is dry)	Mark with an x
Dry (unsaturated soil)		Wetland filling		0	
Waterlogged (saturated soil)		Wetland full		1–2	
Surface water		Wetland drying		3–5	
Unknown/other		Wetland dry		>5	
		Unable to assess		Unknown	
Source of information:					

Photo point (IWC Assessment Procedure Step 9)

A minimum of one photo from an established photo point is required.
Coordinate system used: VicGrid94 | MGA (circle)

Photo 1 Zone (MGA only):_____Easting:_____Northing: _____
Direction faced:_____(compass bearing values between 0 and 360°), **Camera photo number/code**_____

Photo 2 Zone (MGA only):_____Easting:_____Northing: _____
Direction faced:_____(compass bearing values between 0 and 360°), **Camera photo number/code**_____

Photo 3 Zone (MGA only):_____Easting:_____Northing: _____
Direction faced:_____(compass bearing values between 0 and 360°), **Camera photo number/code**_____

Wetland identifier: **Wetland name (if any):** **Date:**

Wetland catchment

IWC Assessment Procedure Step 10a – wetland buffer

1. Mark the wetland buffer on base map 1. The buffer is the native vegetation adjacent to the wetland (from the maximum inundation level outwards). Consider the following:
   - For the purposes of the IWC buffer measure, native vegetation is defined as vegetation where the overstorey (if present) is predominantly native, and native species make up more than 25% of the total understorey cover
   - Areas of revegetation are classed as native vegetation if they simulate the natural EVC and meet the above criteria—also mark these areas on base map 1
2. Measure the buffer width around the wetland to calculate the average. Where the buffer width is greater than 50 m, consider this as 50 m when calculating the average. Circle the corresponding average buffer width score in column [A].
3. Determine the percentage of the wetland perimeter with a buffer and circle the corresponding score in column [B].
4. Multiply the average buffer width score [A] with the percentage of wetland perimeter score [B] and enter in [C].

Wetland buffer width and continuity

Average buffer width (m)	Score [A]
>0–5	0.5
>5–20	1.0
>20–50	1.5
>50	2.0

% of wetland perimeter with a buffer	Score [B]
0–5	0
>5–25	1
>25–50	2
>50–75	3
>75–95	4
>95	5

Wetland buffer assessment score ([A] x [B])	[C]

IWC Assessment Procedure Step 10b – land use

1. Observe the land use within 250 m of the wetland and determine whether it differs from that shown on the land-use map. Document 'Yes' or 'No' in box [D]. If yes, state the difference in box [E].
2. Determine the percentage of land in each intensity class within 250 m of the wetland to the nearest 5% to total 100% and enter values in [F].
3. Multiply the percentage [F] by the intensity factor [G] for each land-use class and enter the result in [H].
4. Add the results for each category and enter total in box [I].
5. Using [I], select the appropriate land-use score from [J] and circle.
6. Add the buffer assessment score [C] to the land-use intensity score [J] to obtain the Wetland catchment sub-index score and enter it in [K].

Land-use intensity within 250 m of the wetland

Is land use within 250 m of the wetland different from that on the land-use map?	Yes | No [D]	If Yes, document the difference [E]

Land use intensity class	% of adjacent land in each land- use intensity class (must total 100%) [F]	Intensity factor [G]	Result [H]
Very high		0	
High		1	
Medium		2	
Low		3	
Very low		4	
		Sum of results	[I]

Sum of results category	Score [J]
0–65	0
>65–135	2
>135–200	4
>200–265	6
>265–335	8
>335	10

Wetland catchment sub-index score [C] + [J]	[K]

Guidance for determining land-use intensity

Land-use intensity class	Examples of land use	Intensity factor
Very high	Built urban (including alpine resort development), industrial, intensive animal production, multiple-lane roads, multiple-track railway, aqueduct, water storage	0
High	Cleared land for urban development, irrigated agriculture (cropping, horticulture and pasture), broad-acre cropping, medium- or high-density grazing, golf course, playing field, major roads (not multiple-lane), vehicle tracks in peatland wetlands	1
Medium	Non-indigenous plantation forestry, low-density grazing, minor roads/tracks and railways	2
Low	Forestry in native forests, nature conservation with moderate to high recreational use, vehicle tracks (non-peatland wetlands). If vehicle tracks are present in peatland wetlands, assign class as medium.	3
Very low	Nature conservation with low recreational use	4

Wetland identifier: **Wetland name (if any):** **Date:**

Physical form

IWC Assessment Procedure Step 11a – wetland area

Note: An enlargement of the wetland is considered an aspect of altered hydrology and is not part of the wetland area assessment.

1. Identify the original and current wetland boundary on the ground, and using base map 1, estimate the percentage reduction in area. Circle the corresponding score in column [A].
2. If there is a reduction in effective wetland area, document the reason(s) by marking an **x** in column [C] against the appropriate option(s).
3. If there is a reduction in effective wetland area, document the time when the reduction took place by marking an **x** in column [D] against the appropriate option(s).

Reduction in effective wetland area

% reduction in wetland area	Score [A]
>95	0
>75–95	2
>50–75	4
>25–50	6
>5–25	8
0–5	10

What is the reason for a reduction in wetland area?	[C]
Not applicable (no reduction)	
Infilling	
Barriers to filling (such as levees or roads without culverts)	
Fire (for peat-dominated wetlands only)	
Channelisation/drains within the wetland	
Other (please state)	
When did the reduction in wetland area take place?	[D]
Not applicable (no reduction)	
unknown	
< 1994	
1994–2003	
2004–2013	
After 2013	
Enter year if known:	

IWC Assessment Procedure Step 11b – wetland bathymetry

1. Mark with an **x** in column [E] the activities present that change the bathymetry of the wetland. Do not include activities captured in the soils component.
2. Show the location of these activities on base map 1.
3. Determine the severity and extent of the change and enter it in [F]. Severity guidance is provided in the table below.
4. For each severity class, multiply the percentage at [F] by the severity factor [G] and enter the result in the score column.
5. Sum the reduction in wetland area score in [A] and the change in bathymetry score in [H] and enter total at [I].

Activities that change the bathymetry of the wetland	[E]
Excavation of the wetland bed (e.g. channels, dams, dredging)	
Landforming (e.g. raised-bed cropping, laser-levelling, building mounds, levees, aqueducts, tracks)	
Other (please state)	
No activities that change bathymetry	

Severity of change in the bathymetry of the wetland

Severity	**% of wetland area (must total 100%)** [F]	**Severity factor** [G]	**Score (**[F] **x** [G]**)**
High		0	
Medium		0.05	
Low		0.075	
None		0.1	
Change in bathymetry score (sum of severity scores above)			[H]
Physical form sub-index score [A] + [H]			[I]

Guidance for determining the severity of change to the bathymetry of the wetland

Severity rating	Examples of wetland bathymetry change
High	Change in bathymetry, in which bed of wetland has been raised or lowered by >50 cm due to excavation and/or the landforming activities listed above
Medium	Change in bathymetry, in which bed of wetland has been raised or lowered by >10–50 cm due to excavation and/or the landforming activities listed above
Low	Change in bathymetry, in which bed of wetland has been raised or lowered by <10 cm due to excavation and/or the landforming activities listed above

Notes:

Wetland identifier: **Wetland name (if any):** **Date:**

Hydrology

IWC Assessment Procedure Step 12 – wetland water source

1. Mark the water sources of the wetland with an **x** in column [A].
2. In column [B], enter the level of confidence you have in determining the wetland water source(s).
3. In column [C], enter the source of information used to determine the water source from using one of the following categories:
   - Current wetland inventory
   - Field data or observation
   - Local knowledge (landholder or land manager)
   - Wetland management plan or report
   - Other (please describe).
4. Mark, using an **x**, activities that change the wetland's water regime in column [D].
5. Determine the severity of change on the timing of inundation and frequency/duration of inundation category by circling one option in each column of Table [E]. Total and enter in [F] (frequency/duration categories are described in the table at the bottom of the page).
6. Enter the level of confidence you have in your assessment at [G].
7. At [H], enter the source of information used to make your assessment using one of the following categories:
   - Field data or observation
   - Local knowledge (landholder or land manager)
   - Wetland management plan or report
   - Other (please describe).

Water source(s) for the wetland	[A]	[B] Confidence (Options: High, Medium, Low)	[C] Source of information (see Step 3)
River/stream (water delivered via in-channel or over-bank flows)			
Local surface run-off			
Groundwater			
Artificial (discharge from agriculture/industry/ urban or environmental water delivered through channels and regulating structures)			

Activity that changes the wetland's water regime	[D]
River regulation	
Activities that change the local surface drainage patterns	
Artificially manipulated water inflow or drawdown that is not associated with maintaining or enhancing the condition of the wetland	
Obstruction, regulation or alteration of the connection between the wetland and its water source	
Obstruction or regulation of natural water outlets	
Drainage of water from the wetland through a pipe or channel	
Disposal of waste or drainage water into the wetland that is not associated with maintaining or enhancing the condition of the wetland	
Extraction of water directly from the wetland	
Activities that permanently raise the water level when full (e.g. damming the wetland or constructing levees to restrict the spread of water)	
Activities leading to an increase in groundwater height	
Activities leading to a decrease in groundwater height	
Other (please state)	
No activities present that change the water regime	

[E] **Determining the severity of change to the water regime (select one option in each column)**

Timing and duration	**Water regime category (see table at bottom of page)**
Changed to another season [0]	Change in category [0]
Changed but still within same season [5]	Some change but not sufficient to change category [5]
Little or no change [10]	Little or no change [10]

Severity of change in water regime score (total from each column above) (Note: this is the Hydrology sub-index score.)	[F]
How confident are you about your assessment? (Options: High, Medium, Low)	[G]
What main source of information did you use to make your assessment? (Select from a category in Step 7.)	[H]

Water regime categories used to assess severity of change to the water regime

Category	**Frequency of inundation**	**Duration of inundation**
Permanent	Constant, annual or less frequently	Never dries or dries rarely (i.e. holds water at least 8 years in every 10)
Periodically inundated – Seasonal	Annual or near-annual inundation (i.e. fills 8–10 years in every 10)	1–8 months
Periodically inundated – Intermittent	Infrequent – holds water, on average 3–7 years in every 10	>1 month to more than 1 year, then dries
Periodically inundated – Episodic	Infrequent – holds water, on average <3 years in every 10	>1 month to more than 1 year, then dries

Wetland identifier: **Wetland name (if any):** **Date:**

Water properties		
IWC Assessment Procedure Step 13a – nutrient enrichment 1. Mark with an **x** in column [A] activities leading to nutrient enrichment. 2. Document the severity of nutrient enrichment using the scores provided and mark at [E]. 3. Enter the level of confidence you have in your assessment at [C]. 4. At [D] enter the source of information used to make your assessment using one of the following categories: • Field data or observation • Local knowledge (landholder or land manager) • Wetland management plan or report • Other (please describe). 5. Document evidence of nutrient enrichment if available (e.g. algal blooms, field data) and enter at [E].	**Nutrient enrichment**	[A]
	Discharge of nutrient-rich water to the wetland (e.g. from sewage, industrial effluent or irrigation water)	
	Drainage of nutrient-rich water into the wetland from an urban area (via a drain)	
	Run-off of nutrients to wetland (e.g. from fertiliser application or grazing)	
	Grazing by livestock in the wetland	
	Grazing by feral animals in the wetland (e.g. pigs, goats, deer, rabbits, horses – please state the animal/s in box to the right)	
	Application of fertiliser in the wetland	
	Aquaculture	
	Other (please state)	
	No activities leading to nutrient enrichment	
	What is the severity of nutrient enrichment? **No enrichment [10], Low [7], Medium [5], High [0]**	[B]
	How confident are you about your assessment? (Options: High, Medium, Low)	[C]
	What main source of information did you use to make your assessment? (See categories in Step 4.)	[D]
	Document evidence of nutrient enrichment if available (e.g. algal blooms, nutrient data).	[E]
IWC Assessment Procedure Step 13b – change in salinity 1. Mark with an **x** in column [E] the reason for a change in salinity from its reference (i.e. pre-European) state. 2. Document the severity of the change in salinity and mark in [F] using the scores provided. 3. Enter the level of confidence you have in your assessment at [G]. 4. At [H], enter the source of information you used to make your assessment using one of the following categories: • Current Wetlands / Pre European Wetlands spatial inventories • Field data or observation • Local knowledge (landholder or land manager) • Wetland management plan or report • Other (please describe) 5. Add the scores for both measures [B] and [F] to obtain the sub-index score and enter at [I]. 6. Document evidence of a change in salinity if available (e.g. change in salinity classification, change in vegetation, change in wetland fauna, salinity data) and enter at [J].	**Change in salinity**	[E]
	Saline groundwater intrusion resulting in an increase in salinity from its natural state	
	Saline water intrusion from the marine environment, resulting in an increase in salinity from its natural state	
	Saline water is unnaturally delivered to a fresh or brackish wetland.	
	Fresh water is unnaturally delivered to a saline wetland.	
	Other (please state)	
	No change in salinity	
	What is the severity of change in salinity? **Little or no change [10], Low [7], Medium [5], High [0]**	[F]
	How confident are you about your assessment? (Options: High, Medium, Low)	[G]
	What main source of information did you use to make your assessment? (See source of information categories on left.)	[H]
	Water properties score ([B] + [F])	[I]
	Document evidence of a change in salinity if available (e.g. change in salinity classification, change in vegetation, change in wetland fauna, salinity data).	[J]

Wetland identifier: **Wetland name (if any):** **Date:**

Soils

IWC Assessment Procedure Step 14 – wetland soil disturbance

1. Mark with an **x** in column [A] the presence of activities that cause soil disturbance.
2. Show location of soil disturbance on base map 1.
3. Estimate the percentage of wetland soils in each soil disturbance severity class and enter in [B] (guidance is provided in the table at the bottom of the page).
4. For each class, multiply the % of wetland soils affected by the severity factor [C] and enter in [D].
5. Sum the results in [D] and mark result in [E] – this is the soils sub-index score.

Activity that causes soil disturbance	[A]
Pugging by livestock	
Disturbance or pugging by feral animals (e.g. pigs, goats, deer, rabbits, horses—please state the animal/s in box to the right).	
Carp mumbling	
Trampling by humans	
Cultivation	
Driving of vehicles in the wetland	
Other (please state)	
No activities that cause soil disturbance	

Soil disturbance severity

Severity of disturbance	**% of wetland soils** (must add to 100%) [B]	**Severity factor** [C]	[D]
High		0	
Medium		0.1	
Low		0.15	
No disturbance		0.2	
		Soils sub-index score	[E]

Guidance for determining severity of soil disturbance

Severity rating	**Soil disturbance examples**
High	• High density of pug marks (page 31, Plate 4) • Severe soil disturbance by livestock (aside from pugging, e.g. erosion or uprooted vegetation) • High density of deer or feral pig wallow (page 31, Plate 5) • High density of carp mumbling (page 31, Plate 6) • High density of rabbit diggings • Rabbit warrens present • High density of human trampling • High density of vehicle tracks • Cultivation
Medium	• Medium density of pug marks (page 31 , Plates 2 and 3) • Medium level of soil disturbance by livestock (aside from pugging, e.g. erosion or uprooted vegetation) • Medium density of deer or feral pig wallow • Medium density of carp mumbling • Medium density of rabbit diggings • Medium density of human trampling • Medium density of vehicle tracks
Low	• Low density of pug marks • Slight soil disturbance by livestock (aside from pugging, e.g. erosion or uprooted vegetation) • Low density of deer or feral pig wallow • Low density of carp mumbling • Low density of rabbit diggings • Low density of human trampling • Low density of vehicle tracks (page 31, Plate 1)

Notes:

Wetland identifier: **Wetland name (if any):** **Date:**

Biota (wetland vegetation quality assessment – steps 15b–e)

IWC Assessment Procedure Step 15a – EVC assessment summary

1. Determine the wetland EVCs present at the wetland (use the wetland landscape profile diagrams commencing on page 44 to assist). In the case of an aggregate where the components are difficult to resolve, use the aggregate and assess as usual.
2. Determine whether any EVC should be split into units for assessment and identify these as Unit 1, Unit 2, etc. in brackets after the EVC name. Where there is a significant difference in quality between two or more distinct parts of an EVC, the EVC should be divided into separate units for assessment, and each unit assessed separately. This may occur, for example, where a fence prevents livestock grazing part of the EVC.
3. Mark distribution of wetland EVCs (and units, if relevant) within the wetland on the EVC base map.
4. Areas of the wetland that are not vegetated (or nearly so) are classified as EVC 990 (open water/bare soil/mud). EVC 990 is not included in the vegetation scores and should not be listed on the assessment summary below. These areas should however be mapped and assessed for weeds and indicators of altered processes, as described in the benchmark.
5. Determine the percentage of the wetland covered by vegetation (i.e. all EVCs excluding EVC 990); enter value in box [A].
6. Record EVC name [B] and EVC number [C] for each EVC or EVC unit (excluding EVC 990).
7. Estimate the percentage of the vegetated area of the wetland covered by each EVC and/or EVC units and enter at [D]. (The sum of these should equal 100%.)
8. Assess each EVC or EVC unit separately and transfer score to [E]. If it was not possible to assess the EVC, write 'NA' instead of the EVC score at [E]. In this instance, no overall biota score can be obtained.
9. Multiply the individual EVC scores [E] by the proportion (%) of the vegetated wetland area that is covered by the EVC [D] and enter the result in [F].
10. Add the results [F] divided by 100 and enter the total in box [G] to obtain the biota sub-index score.

What percentage of the wetland area is covered by vegetation? (Do not include EVC 990 as this is unvegetated.) [A] (%)

EVC name (and unit number, if relevant) [B]	**EVC No.** [C]	**Percentage of vegetated area covered by EVCs**[1,2] [D]	**EVC score** [E]	**Result** [F]
		Biota sub-index score (sum of [F] divided by 100)		[G]

[1] Excluding EVC 990

[2] Must total 100%

Size ranges used for critical life forms in the IWC

Life form	**Size classes**				
	Tiny	**Prostrate**	**Small**	**Medium**	**Tall**
Shrubs	NA	<20 cm	20 cm – <1 m	1 – 3 m	>3 m
Herbs	<5 cm	<5 cm and carpet or mat-forming	5 cm – <15 cm	15 cm – <50 cm	>50 cm
Graminoid	<10 cm	<10 cm and mat-forming	10 cm – <30 cm	30 cm – <1m	>1 m

Notes on size ranges:

- The range of a given size class can differ from the most similar Vegetation Quality Assessment category (Habitat Hectares).
- The term semi-shrubs applies to robust herbs that are to some extent woody—where this term is used in the benchmarks, the relevant size range for herbs applies.
- Graminoids can variously include grasses, sedges, rushes, restiads, mat-rushes and grass trees. Where the term 'monocot' is used in a generalised way in the benchmarks, the relevant size range as for graminoids applies.
- 'Cane-grass' is sometimes used in the benchmarks as a life form (rather than more generalised 'medium-to-tall grasses')—this term applies to hard-stemmed grasses, notably of the genus *Eragrostis*—these species can appear either tufted or non-tufted, according to growing conditions and grazing pressure.
- The term 'tiny floating aquatics' is self-explanatory—these species comprising detached individual plants up to a few cm in size, but frequently much smaller, that are not rhizomatous.

Wetland identifier: **Wetland name (if any):** **Date:**

Biota (wetland vegetation quality assessment – steps 15b–e)

IWC Assessment Procedure Step 15b-e – individual EVC assessment

1. From EVC summary sheet, record EVC name [A] and number [B].
2. Refer to the EVC benchmark description.
3. Check the benchmark description for any conditions when the EVC should not be assessed. If not assessed, record 'NA' on EVC assessment summary at [D].
4. Document the number of the **critical life-form group (not the number of species in the group)** identified in the benchmark at [C].
5. List all critical life forms present in table [D].

Note: Only wetland species should be used to assess critical life forms. Species should only be allocated to one critical life-form group, and allocation should be based on the mature life stage. Opportunistic dryland species should not be included.

6. For each critical life form present, indicate whether it is unmodified (UM), or modified by a reduction in species (S), percentage cover (C) or both (B).
7. Count the number of critical life forms listed that are unmodified (UM) and record at [E].
8. Count the number of critical life forms listed that are modified (i.e. scored as (S), (C) or (B) and record at [F].
9. Record the number of critical life forms absent at [G].
10. Determine the critical life -form groups score [25 x E/C + 25/2 x F/C)] and enter at [H].
11. Determine and circle **weeds** score and enter value at [I].
12. **List high-threat weeds** on the reverse of this sheet.

Note: high-threat weeds include those listed in the benchmark and other weeds that have the ability to displace native vegetation.

13. Determine **indicators of altered processes** score and enter at [J]. Refer to the critical life-form groups listed in benchmark Section 1 to determine whether or not 50% of these are present.

Note: This can include invasions of indigenous or introduced species occurring outside their normal range of habitat or performance. It could also include declines in indigenous species where this is indicating hydrological change.

14. Determine **vegetation structure and health** score and enter at [K].
15. Add the scores for each benchmark attribute to get the EVC score, divide by 5 and transfer to the EVC assessment summary.
16. Optional: list any other species of interest/ or a full species list on the EVC base map.

EVC name (and unit number, if relevant) [A]	**EVC No.** [B]

Critical life-form groups (EVC benchmark Section 1)

Number of critical life forms identified in the benchmark	[C]
Critical life forms present [D]	**Is the critical life form unmodified (UM) or modified by a reduction in species (S), % cover (C), or both (B)**
Number of life forms present that are unmodified	[E]
Number of life forms present that are modified	[F]
Number of life forms absent	[G]
Critical life-form groups score [(25 x (E/C)) + ((25/2) x (F/C))] (round to two decimal places)	[H]

Weeds (EVC benchmark Section 2)

Total cover of weeds or crop in EVC	**Total cover of high-threat weeds**					
	nil	>0-<1%	**1-<5%**	5-<25%	25-<50%	**≥50%**
≥50%	7	6	5	3	1	0
25–<50%	12	10	8	6	3	-
5–<25%	17	15	13	10	-	-
1-<5%	23	21	18	-	-	-
<1%	25	23	-	-	-	-

Weeds score	[I]

Indicators of altered processes (EVC benchmark Section 3)	**Score**
EVC completely displaced and site substantially modified (e.g. cropped or completely drained)	0
<50% of critical life-form groups still represented	5
≥50% of critical life-form groups present (or exempted as per benchmark) **and** altered process as:	
(a) severe	10
(b) moderate	15
(c) minor	20
No evidence of altered process	25
Indicators of altered processes score	[J]

What is the evidence for the altered process?

Vegetation structure and health (EVC benchmark Section 4)

% of benchmark cover	**% of cover of structural dominants that are healthy**		
	>70	**30–70**	**<30**
<10	5	2	0
10–50	15	10	5
>50	25	20	15

Vegetation structure and health score	[K]
Wetland EVC score ([H] **+**[I] **+**[J] **+** [K])**/5**	[L]

Wetland identifier: **Wetland name (if any):** **Date:**

High-threat weed species

[Optional] list (i) species of note, or (ii) all species observed in wetland, or (iii) all species observed in the EVC. Please circle option to indicate what has been listed.

Please note any comments or problems encountered with this assessment in the space provided below

General comments or queries can be reported by email: IWC.support@delwp.vic.gov.au

www.iwc.vic.gov.au