

Statewide wetland geospatial inventory update

Factsheet 1: Outcomes from the statewide wetland geospatial inventory update

1 Introduction

In 2011 the Victorian Department of Environment and Primary Industries (DEPI) began a program to develop a geospatial wetland inventory that included updated wetland mapping across Victoria and to classify wetlands in accordance with Victoria's new aquatic system classification framework (DEPI *in prep*). This project has produced three new spatial layers: WETLAND 2013, WETLAND 2013_Detailed and WETLAND 1788_V2013 (see Factsheet 8 for full description of attributes included in each layer).

This Factsheet presents a summary of the project outcomes and references a suite of other Factsheets that describe the project methods in greater detail. The suite of Factsheets from this project include:

#	Title
1	Outcomes from the statewide wetland geospatial inventory update (this Factsheet)
2	Method to classify wetland system
3	Method to classify salinity regime
4	Method to classify water regime
5	Method to classify water source
6	Method to classify dominant vegetation
7	Method to classify wetland origin
8	Attributes of the statewide wetland geospatial inventory
9	Wetland numbering system

2 Method

The statewide wetland geospatial inventory update involved the following key tasks:

Task	Method described within
Review and development of methods and data protocols for wetland mapping	Alluvium 2011 (and below)
Incorporation of regional mapping undertaken since 1994	Alluvium 2011 (and below)
Repositioning planimetrically inaccurate wetlands	Alluvium 2011
Supplemented mapping of current extent in south west Victoria	Alluvium 2011 (and below)
Supplemented mapping of current extent in parts of Victoria that had not been updated	Factsheet 1, in the section below
Supplemented mapping of pre-European extent	Factsheet 1, in the section below
Classification under Victoria's new aquatic system classification framework	Factsheet 1, supported by Factsheets 2 to 7
Application of a new wetland numbering and data structure	Factsheets 8 and 9

2.1 Supplemented mapping of current extent

The first stage (Phase 1) of the *Statewide wetland geospatial inventory update* involved the development, documentation and application of a method to amend the mapping of wetland extent in Victoria (Alluvium 2011). The amendments to wetland mapping involved supplementing the existing wetland mapping, which involved identifying and delineating wetlands which have not previously been mapped, but not modifying the extent of existing wetlands.

The supplemented mapping of current wetland extent was undertaken across a 1,100,000 hectare priority area in south-west Victoria. This mapping supplemented the Wetland 1994 dataset and regional wetland updates that had already been undertaken throughout Victoria before the *Statewide wetland geospatial inventory update* (refer to Alluvium 2011 for details).

The scope of mapping in the next stage (Phase 2) was to continue mapping new wetlands across the remainder of Victoria, covering all areas that had not been updated at the completion of Phase 1. The mapping method for this work mirrored that adopted for Phase 1 (i.e. primarily aerial photograph interpretation as discussed in Alluvium 2011), with the following refinements:

- Tightening the definition of a wetland, so that only ‘functioning’ wetlands are mapped (refer to discussion in Alluvium 2011 about ‘functioning’ and ‘non-functioning’ wetlands). The wetland definition adopted for Phase 2 was therefore *“areas of permanent or periodic/intermittent inundation that hold static or very slow moving water, which leads to the development of hydric soils, and have developed biota adapted to flooding. Wetlands may be formed by natural processes or human activities.”*
- Broad review of wetlands mapped in Phase 1 to remove from Wetland 2013 the non-functioning wetlands that had been mapped in south-west Victoria. Non-functioning wetlands are those that have major modifications that impair the wetland’s topography, hydrology, soils and/or biota – refer to Alluvium 2011 for further discussion on the definition and characteristics of non-functioning wetlands.
- Mapping of sub-1 ha wetlands (predominantly farm dams) was not continued in Phase 2 because a separate project had been undertaken to map farm dams across the state and the mapping time allowance per unit area for Phase 2 was substantially reduced compared to Phase 1.

The current project also drew upon three additional GIS data sets that were not available in Phase 1 of the inventory update. These three data sets were in addition to the supporting GIS data used in Phase 1 (refer to Table 2 of Alluvium 2011)¹:

Dataset name	Dataset description / link
All Victorian Dam Boundaries	A dataset developed for DEPI by SKM that maps dams across Victoria (unpublished)
DRWaterbodies	Melbourne Water’s stormwater assets database (unpublished). This database shows Melbourne Water constructed wetlands, urban lakes, bioretention systems and sediment traps. It’s abbreviation in the Wetland 2013 dataset is ‘MW cons waterbodies’
Wetlands_ Waterbodies	A dataset created for Melbourne Water using automated methods to attempt to identify and delineate waterbodies (unpublished). The dataset was constructed using a variety of methods including cut and fill of a 1m LiDAR DEM and remote sensing using the Normalised Difference Vegetation Index (NDVI). It’s abbreviation in the Wetland 2013 dataset is ‘MW WetWaterbodies’.

2.2 Supplemented mapping of pre-European extent

The regional wetland mapping updates undertaken prior to the *Statewide wetland geospatial inventory update* focused on delineating the current extent of wetlands, but did not attempt to delineate the expected extent of each wetland under pre-European conditions. These updates therefore had the impact of increasing the known current extent of wetlands, but did not increase the inferred pre-European extent of wetlands. The consequence of this was that an (inevitable) comparison of extent of Wetland 1788 and Wetland 2013 would suggest (falsely) that wetland extent had increased since settlement.

To address this issue, the project included a task to identify which features in the regional wetland updates were naturally occurring and add these to the updated Wetland 1788 dataset. The project considered two strategies that could be used to estimate and map pre-European wetland extent:

1. Tag all updated wetlands as either ‘natural’ or ‘man made’ then copy all ‘natural’ features into the Wetland 1788 dataset, therefore updating the 1788 dataset using the 2013 dataset. However, the shape of an individual wetland boundary is likely to have been quite different under pre-European conditions compared to the current extent. In general pre-European size is expected to be larger, therefore this strategy would result in a general underestimate of pre-European extent.

¹ Alluvium 2011 described the GIS data sets used in Phase 1 of the project. Following the completion of Phase 1 additional metadata was supplied for the alpine mapping i.e. the ‘ALPS’ dataset. That metadata describes how staff at the Arthur Rylah Institute (DEPI) compiled the alpine mapping in 2008, based primarily on peatland mapping from 1982, frog mapping, EVC layers of various scales from the 1990s to 2000s and additional mapping carried out by Arn Tolsma between 2004 and 2008.

2. Tag all updated wetlands as either 'natural' or 'man made', then accurately re-delineate all 'natural' features to provide an estimate of pre-European extent for the Wetland 1788 dataset. While this approach is most accurate, it is also much more time consuming and would have significantly reduced the total coverage of supplemented mapping possible in Phase 2 of the project. To be undertaken correctly and accurately it would require site specific analysis of data such as early topographic survey maps, on-ground interpretation and/or remote sensing of soil types.

Due to time and resource constraints approach number one was adopted for Phase 2 of the project, recognising that the mapping of pre-European wetland extent is expected to underestimate the true extent that occurred at that time.

The task therefore involved aerial photograph interpretation of all wetlands that had been added since Wetland 1994, to determine whether each wetland would have occurred naturally or if it was man made. Wetlands that were categorised as occurring naturally were added to the Wetland 1788 dataset with their current boundary delineation. One of the three general categories was assigned to each wetland to represent how representative the current extent is of their inferred pre-European extent (see below). The categorisation of relative pre-European size was based only on interpretation of the current aerial imagery and topography (i.e. examining patterns in the landscape and elevation), but did not incorporate review of historical maps, imagery or on-ground interpretation. For this reason, these categorisations of relative pre-European size are considered to be indicative estimates only. The categories are as follows:

- True pre-European size approximates mapped (geometry is unedited from new 2013 mapping)
- True pre-European size is larger (>3x) than mapped (geometry is unedited from new 2103 mapping)
- True pre-European size is smaller (<1/3x) than mapped (geometry is unedited from new 2013 mapping)²

Wetlands that had previously been mapped in Wetland 1788 were assigned to the following category:

- True pre-European size approximates mapped (geometry is from original Wetland 1788 spatial layer)

2.3 Classification under Victoria's new aquatic system classification framework

Victoria has used a wetland classification system commonly known as the Corrick system since the late 1970s. The Corrick system was developed between 1976 and 1982 and has been widely utilised in Victoria to underpin natural resource management and wetland policy and science (DEPI *in prep*). Recent advances in wetland classification in Australia to facilitate consistent reporting at the national level, better information about wetlands and limitations of the Corrick system precipitated a review and update of the Victorian wetland classification system.

The classification framework outlined six classification attributes, and the range of possible categories under each attribute (Table 1). The scope of this task was to develop and implement a method to classify wetlands in the Wetland 2013 dataset in accordance with the new framework.

² Features that have increased in size since European settlement are typically due to construction of a dam

Table 1 . Summary of the Victorian classification framework attributes and categories (DEPI *in prep*)

Classification attributes	Possible categories	Category definition
Wetland system	Lacustrine	Non-tidal wetland with less than 30% cover of emergent aquatic vegetation
	Palustrine	Non-tidal wetland with greater than 30% cover of emergent aquatic vegetation
	Estuarine	Semi-enclosed tidal wetlands
	Marine	Tidal wetlands in bays
Salinity regime	Fresh	Wetlands with salinity concentrations between 0 and 3,000 mg/L
	Saline – Hyposaline	Wetlands with salinity concentrations between 3,000 and 10,000 mg/L
	Saline – Mesosaline	Wetlands with salinity concentrations between 10,000 and 50,000 mg/L
	Saline – Hypersaline	Wetlands with salinity concentrations between 50,000 and 350,000 mg/L
Water regime	Intertidal	Inundated twice daily, with inundation lasting hours between tide cycles
	Supratidal	Inundated several times per year, with inundation lasting days to months
	Permanent	Inundated constantly, rarely drying completely
	Periodically inundated	Inundated annually to infrequently, holding water for 1 month to 1 year before drying
Water source	Groundwater	Wetlands coinciding with mapped groundwater-dependent ecosystems
	River	Wetlands that receive water from in-channel or overbank river flows
	Local surface runoff	Wetlands that receive water from local runoff
	Tidal	Wetlands which are inundated by regular or spring tides
	Artificial	Wetlands which depend on an artificial water source
Dominant vegetation	Forest/Woodland	Applicable for lacustrine or palustrine systems
	Shrub	Applicable for lacustrine or palustrine systems
	Sedge/grass/forb	Applicable for lacustrine or palustrine systems
	Fern	Applicable for lacustrine or palustrine systems
	Moss/heath	Applicable for lacustrine or palustrine systems
	Mangrove	Applicable for marine or estuarine systems
	Coastal saltmarsh	Applicable for marine or estuarine systems
	Seagrass	Applicable for marine or estuarine systems
No emergent vegetation	Applicable for all wetland systems	
Wetland origin	Naturally occurring	Wetlands of natural origin which essentially retain their natural form
	Human-made	Purpose built wetlands

The method used to classify wetlands under each of the six classification attributes is detailed in Factsheets 2 to 7. In summary, the classification approach involved:

- reviewing all known existing datasets that could potentially be useful in classification, to determine whether they contained spatial or attribute information that could inform the wetland classification, and how that information could be used
- developing and proposing a spatial analysis approach that utilised available data to classify wetlands as best as possible, given limitations with the existing data
- implementing the spatial analysis approach.

Through this process a total of 19 different datasets were used to classify wetlands under the six classification attributes. Figure 1 shows which of these 19 datasets were used to classify each of the six classification attributes, and also shows the inter-relationships and dependencies between different classification attributes.

For more details on the method and data used for each classification attribute, the reader is referred to Factsheets 2 to 7.

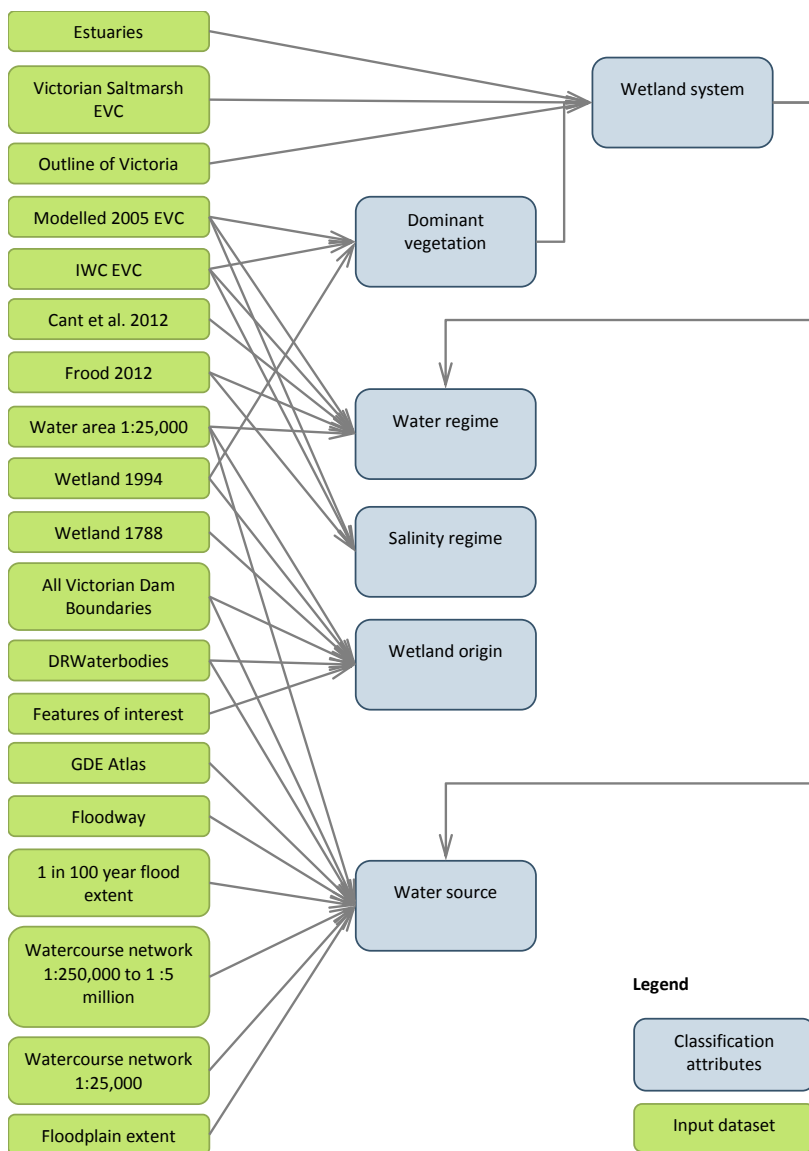


Figure 1. Schematic showing which of the 19 datasets were used to classify wetlands under each of the six classification attributes

3 References

Alluvium (2011). Statewide wetland geospatial inventory update project outcomes. Report P111012R02 by Alluvium for Department of Sustainability and Environment, East Melbourne.

Department of Environment and Primary Industries (*in prep*). Classifying Victoria’s wetlands: a new framework. Draft unpublished report from September 2011. Department of Environment and Primary Industries, East Melbourne, Victoria.

4 Acknowledgement

This work was prepared for the Department of Environment and Primary Industries by Mark Stacey and other staff at Alluvium Consulting Pty Ltd, Richmond, Victoria.