

# WetMAP – Victoria’s Wetland Monitoring and Assessment Program for environmental water

## Vegetation Monitoring Approach



### Demonstrating outcomes from environmental watering of wetlands

WetMAP is a state-wide monitoring program designed to assess ecological responses of vegetation, waterbirds, frogs and fish to the delivery of water for the environment in Victorian wetlands. Monitoring for the current stage of WetMAP (2016–2020) is coordinated by the Arthur Rylah Institute (ARI) and funded through the Victorian government’s \$222 million investment over four years to improve catchment and waterway health.

### Program Objectives

WetMAP objectives are to:

- identify short-term responses of biota to watering events
- identify water regimes (timing, duration, frequency) needed to support self-sustaining populations of key species, and
- determine if current water regimes and wetland management practices are meeting these needs.

Outcomes of WetMAP will inform the management of environmental water and contribute to Victoria’s reporting requirements for the Murray-Darling Basin Plan. Ultimately, WetMAP seeks to inform the development of a planning tool for Catchment Management Authorities (CMAs) and the Victorian Environmental Water Holder.

### Program Design

WetMAP’s design is based on:

- conceptual models of wetland responses to environmental water delivery and natural flooding
- watering objectives defined in state and regional water management plans, and
- Key Evaluation Questions (KEQs) and indicators.

The program design includes both watered wetlands and unwatered wetlands with similar characteristics to the watered wetlands. These will provide data on the response of vegetation to water regimes that are not supplemented by environmental water – typically drier regimes with less frequent inundation.

### Factors that influence the response of vegetation to environmental water

Key drivers affecting the response of vegetation to water regimes include factors and processes that operate at both the local and landscape scale. Local scale factors include vegetation condition, wetland hydrology, salinity, nutrients, grazing pressure and availability of propagules in the wetland – i.e. seeds, spores, tubers, bulbs and turions. Landscape scale factors include connectivity and the availability of seeds and propagules that disperse into wetlands.

Characteristics of individual plant species (e.g. life history strategy, water regime needs, physiological and genetic fitness) and the seed bank (e.g. size, diversity, longevity, germination and establishment requirements) play a significant role in determining future vegetation composition. So too does a wetland’s disturbance history, which includes factors such as altered water regimes, salinity, nutrient enrichment, the presence and density of Carp *Cyprinus carpio*, and grazing by livestock.

Conceptual models are in development for the WetMAP wetlands; these will identify local- and landscape-scale response factors and their interactions. These models will help determine an expected response of the wetland vegetation to water management and environmental water. For example, a naturally seasonally drying wetland that has had a history of sustained unnatural inundation (over 10–20 years) will have a depleted seed bank of mudflat species. It would be expected that these species

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will take longer to re-establish in response to recent water management.

## Vegetation monitoring

Seven Key Evaluation Questions have been developed to examine short- and medium-term responses of wetland vegetation to water management.

### Key Evaluation Questions

- 1 How does disturbance history influence vegetation condition at wetlands that currently receive environmental water?
- 2 How does water management influence the cover of native aquatic and mudflat species?
- 3 How does water management influence the frequency of occurrence of native aquatic and mudflat species?
- 4 Does water management contribute to an improvement (or maintenance) in the condition of Lignum (*Duma* spp.)?
- 5 Does water management facilitate recruitment of Black Box, Red Gum and/or River Cooba wetland EVC(s)?  
*Noting that recruitment of trees in some EVCs is an altered (unwanted) process.*
- 6 Does water management contribute to an improvement (or maintenance) in the condition of Black Box, Red Gum and/or River Cooba?
- 7 Does water management maintain the extent or prevent an increase in the extent of *Typha* spp. and/or *Phragmites australis* (in wetlands where this is a specific management action)?

## Survey methods

Three survey approaches are being used to examine specific vegetation types (tall marsh, understory plants and woody vegetation) expressed during the different hydrologic phases of a wetland.

### Tall marsh

This survey measures the extent of *Typha* spp. and *Phragmites australis*, using a remotely piloted aircraft (drone). Images collected by the drone are stitched together to create a map – and the boundaries of tall marsh are delineated using GIS software. These boundaries will be compared annually to examine changes in extent.

*Timing* – during the optimal growth phase for *Typha* and *P. australis* (spring and early summer).

### Understory plants

Measures of cover and frequency of occurrence of understory plants (aquatic herbs, mudflat species and saltmarsh) are made in 20 1x1 m quadrats nested in 20 x 50 m sampling plots, within each Ecological Vegetation Class (EVC) in the wetland. There are typically three sampling plots per EVC and 2-5 EVCs per wetland.

*Timing* – when the wetland has very recently dried. At this time aquatic herbs are still present and mudflat species have germinated. Timing will vary among wetlands (from mid spring–autumn).

### Woody vegetation

Cover and condition of Lignum are recorded in each 10 m section of the 20 x 50 m sampling plot in each EVC. Counts of tree life stages (i.e. a measure of recruitment) are also made in each 10 m section. Several measures of tree condition (crown extent and density, tip growth and flowering) are made on 30 randomly selected trees in the wetland.

*Timing* – same as the understory plants survey.

Hydrology data are also being obtained from Landsat imagery, gauge boards and data loggers. Soil moisture data is being collected from several wetlands to examine site-specific questions about environmental water and soil moisture.

## Survey locations

Twenty-one wetlands are being surveyed in 2018/19 in the Corangamite, Goulburn-Broken, North Central, Mallee and Wimmera CMA regions. Given the interaction among wetland biota, many of these wetlands are also monitored for waterbirds, frogs and fish, to enable an examination of these interactions.

## Further information

See [www.ari.vic.gov.au](http://www.ari.vic.gov.au) for further information on WetMAP

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ISBN 978-1-76077-471-4 (print) 978-1-76077-472-1 (pdf/online/MS word)

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