

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

Frog 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 frogs to water regimes that are not supplemented by environmental water – typically drier regimes with less frequent inundation.

Factors that influence the response of frogs to environmental water

The wide variety of factors affecting frog populations relate to their life-cycle, which exposes them to many different stressors as they progress from aquatic eggs and tadpoles to terrestrial juveniles and adults. Because of this sensitivity, frogs serve an important role as sentinel species, which function as early indicators of ecosystem change and stress.

Key drivers that affect frog recovery or response to water regimes include processes operating at both local (wetland) and landscape scales. Little is known about the factors that drive frog occurrence and abundance, although at the local scale these most likely include water regime, water chemistry and vegetation, along with other variables that reflect the sites’ disturbance history. For wetlands that receive environmental water, the principal historic disturbance factors are altered water regimes, salinity, nutrient enrichment, number of Carp *Cyprinus carpio* and grazing by livestock. Other factors likely to affect frog occurrence include predation and the presence of virulent pathogens, notably chytrid fungus *Batrachochytrium dendrobatidis*, as well as climate change over the medium-long term.

Data collected through WetMAP will be used to generate hypotheses predicting short- to medium-term frog responses under water regimes that vary in terms of: timing of flooding, type of habitat flooded (permanent, semi-permanent or temporary waterbodies and their structural and landscape attributes), time that water

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remained on flooded areas (hydroperiod), and water quality.

Frog monitoring

This component of WetMAP incorporates two elements:

- a) **Local response monitoring** – monitoring 16 wetlands that receive environmental water, representing a hydrology gradient (short to long periods of periods of inundation).
- b) **Citizen science linkage** – a collaboration to increase the amount of data collected for local response monitoring and promote wetland science within the community.

a) Local response monitoring

This component includes tadpole and adult surveys at wetlands representing a hydrology gradient (short to long periods of periods of inundation). The following three high-level key evaluation questions (KEQs) have been developed to examine the short and medium-term responses of frogs to water management.

Key Evaluation Questions

- 1 How does water management influence the distribution of frogs in northern Victoria?
- 2 Do all frog species respond similarly to water management?
- 3 What are the key elements of water management (e.g. timing, frequency, duration) that influence frog occurrence, abundance and diversity?

Survey methods include:

- **Adult frogs** – a) nocturnal audio-visual surveys on monitoring transects, undertaken by two assessors around the periphery of wetlands and b) collecting calls on automated loggers (AudioMoth) installed at several points around each wetland.
- **Tadpoles** – dip netting sweeps on each monitoring transect.
- **Contextual variables** – weather conditions, habitat variables and water quality.

Habitat types and estimated cover are also recorded along each monitoring transect, including:

a) aquatic vegetation within 10 m of the waterline (categories – submerged vegetation, attached floating, free floating, short emergent, tall emergent and inundated shrubs)

b) terrestrial vegetation within 5 m of the waterline (categories – short herbs and grasses, tall sedges and reeds, shrubs and saplings, trees and bare ground)

c) woodland habitat adjacent to the transect (categories – very short vegetation, short-medium vegetation, lignum, shrubs and saplings, tall marsh, black box, red gum, other trees, litter, logs and rocks/outcrops). Woodlands are categorised according to the relative proportion of young and old trees, canopy cover and basal area.

Timing – Adult frogs are surveyed in late spring-early summer when breeding activity and calling is prominent for most species. Tadpoles are surveyed in summer.

Locations – Sixteen wetlands are being surveyed in 2018/19 in the Goulburn-Broken, North Central, Mallee and Wimmera CMA regions.

b) Citizen science linkage

This component represents a collaboration with Frogs Victoria where volunteers may carry out additional monitoring at all or some of the local response monitoring sites, to supplement data collected through the main program. Monitoring may also target additional sites, to increase the breadth of the project. Data will be collected using consistent methods, following the protocol developed for the local response monitoring program.

Data analysis and interpretation

The occurrence and abundance of adults and tadpoles of different frog species, and species richness, will be modelled using local wetland variables such as wetland habitat, water quality and water regime history, and broader landscape variables such as connectivity, permeability, amount of water in the landscape and catchment land use.

Further information

See www.ari.vic.gov.au for further information on WetMAP

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