

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

Fish 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

Broad objectives for WetMAP are to:

- identify short-term responses of biota to watering events
- identify water regimes (timing, duration, frequency) needed to support populations of biota 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.

It includes both watered and unwatered wetlands with similar characteristics so that ecological responses in watered wetlands can be differentiated from those that did not receive environmental water.

Fish theme development

The WetMAP fish monitoring approach has evolved over time; a reflection of the complex range of issues associated with sampling and interpretation of results. The process has involved the development of initial KEQs; an appraisal by the Independent Review Panel; a pilot program in winter 2017 to provide preliminary information; and a series of planning workshops in early 2018 to develop revised objectives for the WetMAP fish theme. These objectives included:

- development of conceptual models
- definition of testable hypotheses and
- selection of wetlands, sample size and sampling requirements.

The monitoring approach for 2018-20 is outlined below:

Monitoring approach for 2018–20

The current WetMAP fish theme (2018-20) focusses on permanent/semi-permanent wetlands that have a direct connection with rivers. It aims to identify the components of environmental watering (e.g. frequency, magnitude, duration, timing, delivery method, source water and antecedent conditions) that are of benefit to fish in these wetlands. This information, along with results from previous research, will inform the development of conceptual models for small-bodied wetland generalist species with broad distributions and abundance. These include Carp Gudgeon (*Hypseleotris* spp.), Australian Smelt (*Retropinna semoni*), Unspecked Hardyhead

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(*Craterocephalus fulvus*), Murray-Darling Rainbowfish (*Melanotaenia fluviatilis*) and Flat-headed Gudgeon (*Philypnodon grandiceps*). Future stages of WetMAP may also consider fish responses in non-permanent wetlands.

Conceptual models based on our current understanding of fish population responses to watering can provide the rationale for watering recommendations to benefit fish. For example, the timing of water delivery to benefit macrophytes and trees may be modified to increase the benefits to native fish or decrease the benefits to exotic species (e.g. Carp *Cyprinus carpio*). Conceptual models also help identify knowledge gaps for future research.

Key Evaluation Questions

Four Key Evaluation Questions (KEQs) have been identified for the fish theme of WetMAP for monitoring between 2018-20.

Key Evaluation Questions

- 1 How does water delivery to a wetland affect fish abundance and density in the short-term?
- 2 Does water delivery result in an increase in food resources (e.g. plankton) and fish recruitment?
- 3 Do higher levels of fish recruitment result in more fish in a wetland at the end of summer and/or provide additional nutrients for fish-eating fauna?
- 4 If a wetland is connected to source water multiple times, do more fish exit the wetland (following a recruitment and growth period) than enter during the initial watering event?

Survey methods

Survey sites include:

- a) seven wetlands that receive environmental water which are sampled intensively (at least four times per year) targeting:
 - *pre-watering* – to gather information on fish density, abundance and species’ richness
 - *post-watering* – to determine whether the fish community has changed because of connection to a river
 - *summer* - to target recruitment of larval fish and
 - *autumn* - to target an ‘end of season’ assessment of the fish population

Connecting channels will also be sampled to catch fish moving in and out of the wetlands during watering events.

- b) eight wetlands with a broader range of watering regimes, including wetlands that are largely unregulated. These wetlands will be sampled in autumn.

All wetlands will be surveyed using fine and coarse mesh fyke nets. Surveys will record water quality: dissolved oxygen, conductivity, temperature, turbidity, pH and chlorophyll A. Zooplankton will also be sampled.

Survey locations

Wetlands will cover a broad spatial range across northern Victoria.

Case study: Murray Hardyhead

The fish theme for WetMAP incorporates monitoring of Murray Hardyhead *Craterocephalus fluviatilis* populations in wetlands where they have been reintroduced following a successful laboratory rearing and salinity trial. This monitoring will use similar wetland sampling techniques to those described above.

Further information

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

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Figure 1: Small-bodied wetland generalist fish species include Murray Rainbowfish and Unspecked Hardyhead (Photo: ARI)

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