LA TROBE UNIVERSITY

Centre for Freshwater Ecosystems

Fact Sheet

EWKR
Environmental Water Knowledge & Research

Research to support environmental watering: a collaborative approach in the Murray–Darling Basin

Work Summary

Vegetation theme

Wetland and floodplain plants are critical components of both aquatic and terrestrial ecosystems in that they supply energy to support food webs, provide habitat and dispersal corridors for fauna, contribute to other ecosystem services such as nutrient and carbon cycling, and water and sediment oxygenation, have additional aesthetic, cultural and recreational values and intrinsic biodiversity value.

For managers to achieve vegetation outcomes from environmental water, there needs to be a clear understanding of the management objectives for both vegetation and the ecosystem of which they are part. Achieving these objectives requires and understanding of the effect of flow and non-flow drivers (e.g. climatic conditions) influence vegetation composition, structure and condition.

The Vegetation theme aims to i) provide a framework to assist in the development of objectives, indicators and management of water for vegetation outcomes and ii) improve the capacity to predict vegetation outcomes in response to the delivery of environmental water through an enhanced understanding of how flows and non-flow variables influence vegetation responses. The research outcomes will include recommendations to inform environmental water and natural resource management.

Research will focus on defining and conceptually understanding the types of vegetation responses to flows that occur across different vegetation traits (e.g. compositional, structural and process), different levels of ecological organisation (e.g. species, community, vegscape) and across different spatial and temporal scales. The influence of flow will also be considered across a variety of temporal scales, from long-term (decadal) to short-term (annual to one

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Australian Government
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Research will focus on the following key vegetation response types, and investigate these responses in relation to nested flow regimes.

- Compositional vegetation responses at different levels of ecological organisation
- Structural vegetation responses at different spatial scales
- Recruitment responses of long-lived woody vegetation

Research questions

What are the drivers of sustainable populations and diverse communities of water-dependent vegetation?

Under this overarching aim we refined the following:

- *How do we define our vegetation response objectives to consider multiple trait responses, ecological levels of organisation and spatiotemporal scales?*
- *Once defined:*
  - *What flow regimes best support our targeted vegetation response?*
  - *What non-flow drivers influence our targeted vegetation response*?

These will be applied to two priority research topics:

1. **Diversity** (understorey and wetland plants)
2. **Recruitment** of long-lived vegetation (River Red Gum, Black Box, Coolibah and Lignum).

Approach

Proposed research will utilise existing literature, knowledge and data, investigate causal relationships in controlled environments and field assessments that will quantify responses to the flow conditions experienced over the life of MDB EWKR. The risk of un-predictable flow conditions will be managed by adopting this mixed portfolio approach of conceptualisation, data analysis, field assessments and mesocosm experiments.

The proposed approach includes five main research components:

Component V1: Conceptualisation

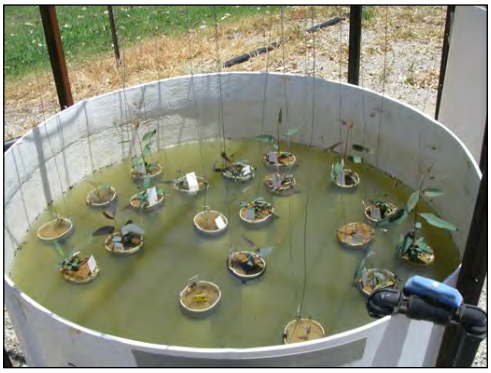
Conceptualisation will organise existing knowledge and new ideas into a conceptual framework to provide a strong theoretical basis the work. It is here that we develop our thinking around the 'what and why' of vegetation responses to flow and seek to provide a structured approach to defining vegetation response objectives to assist in the planning, management and communication of watering decisions and actions. This framework provides the context for outcome evaluation.

Component V2: Data integration and synthesis

Data integration and synthesis will provide an opportunity to combine and explore existing datasets for relationships between vegetation responses, flow and other non-flow drivers. This component will address understorey vegetation responses focusing on compositional responses to flow sequencing and spatial and temporal variability in response to flow. This component will seek to address how legacy affects (of short and long-term flow regimes, coupled with climatic factors such as rainfall) modify responses to flow events in complex floodplain-wetlands.

Component V3: Field site assessments

This component will involve an assessment of flow and non-flow drivers on selected vegetation responses (across a range of strata) and recruitment of long-lived woody vegetation. Trait responses will include compositional, structural and process related metrics. It is anticipated that field work will commence in autumn 2017. Field sampling will involve a stratified design that incorporates different (broad) vegetation classes (e.g. non-woody wetland communities, floodplain shrublands, floodplain woodlands/forests) and different watering regimes (e.g. annual inundation, 1 in 3, 1 in 5, 1 in 10). This component will seek to address how both extant understorey responses and seedbanks (the potential for vegetation response) differ between structural class, flooding regime and location.



Component V4: Mesocosm study

Mesocosm studies will address recruitment of long-lived vegetation and will focus on the responses of seedlings to flow parameters such as duration, frequency and inter-flood dry period. It will also consider the starting condition and development stage (early or late) of seedlings prior to inundation or drying.

Component V5: Theme planning, coordination and reporting

Theme planning, coordination and reporting will enable integration across research components to address the overarching research aim.

Outputs and how they will be used

It is anticipated that outcomes from the Vegetation theme will improve our understanding of the water required to achieve compositional, functional and structural objectives in terms of both the flow regime and characteristics of individual flow events. The Theme will also provide information on how responses vary between locations and how these responses may be influenced by non-flow drivers on vegetation responses.

Keep in touch with MDB EWKR

* EWKR Story space ewkr.com.au
* latrobe.edu.au/centre-for-freshwater-ecosystems