



Field experiment

Campaspe River

Nursery experiment

How can low flows be used, in conjunction with environmental flows, to support the recruitment of instream plants?

Aims

To investigate whether summer/autumn exposure of riverbeds triggers germination of instream* plants.

If so, to then determine how best to manage low flow events along with subsequent environmental flows to enable germination and establishment of instream plants.

**instream plants include aquatic, semi-aquatic and emergent species*

Background

Recruitment is a critical process for the long-term maintenance and improvement of riparian plants. For species that recruit primarily from seed, this process incorporates three main stages: seed germination, seedling survival and seedling growth. Plant recruitment in riparian areas is strongly influenced by flow regimes, although rainfall and geomorphic gradients are also important.

Historically, periods of low flow would have been a feature in most Victorian rivers during summer and autumn. In many regulated Victorian rivers, flows are now much higher at these times of year because

of the delivery of water for consumptive needs. The impact of the changes in low flow periods on riparian and instream plants is poorly known. Some work suggests that elevated spring flows, followed by a drop in water levels in summer/autumn, may be important for the recruitment of some key groups of instream plants. The repeated absence of low flows in summer/autumn may lead to declines in seedbanks and ultimately the viability of local plant populations.

In general, current flow management in Victoria does not incorporate the requirements of plants for periods of low flow; this may limit their environmental benefits and potentially negatively affect plant communities. This project therefore focuses on how appropriate flow conditions can be provided for the successful recruitment of instream plants to support their long-term viability and persistence.

Victorian Environmental Flows Monitoring and Assessment Program

Recruitment of instream plants

Research questions

1. Can riverbed exposure in summer or early autumn trigger the germination of instream plants?
2. Is there a difference in germination response between species and different life forms of instream plants (e.g. submerged, floating or emergent?)
3. How can environmental water be delivered in a way to best support the establishment of native germinants into the population?
4. Where and when can low flows in late summer or early autumn be implemented in Victoria to have the maximum benefit to instream plants, and what is the extent of this benefit?

Approach

To investigate whether the exposure of the lowest parts of the riverbank and parts of the channel bed during late summer and autumn will trigger germination of instream plants, a field experiment on the Campaspe River and a seedbank trial will occur.

A pilot study in early 2020 to germinate seed within Campaspe riverbed sediments showed that germinants of riparian plants were visible about seven days after sediment exposure.

Campaspe River trial

Part 1 – Hydrological study

- Investigate historical flow data to understand details of low flow periods prior to river regulation (timing, frequency, duration, predictability).
- Summarise current delivery constraints in this river as well as other regulated rivers in Victoria.
- Identify any potential negative impacts of undertaking the field experiment, and mitigation options.
- Collate instream species present in the river and their germination needs.
- Undertake a brief literature review of the germination needs of instream plant species in Victoria more generally, to assist in the determination of appropriate flow scenarios.

Part 2 – Field experiment

- Lower the flow levels in the Campaspe River for approximately two weeks in Autumn 2022.
- Undertake three plant surveys to monitor recruitment at existing VEFMAP sites downstream of Lake Eppalock. This includes Barnadown, Doaks Reserve, Campbells Road, Bryants Lane, Strathallan Road, Spencer Road and English's Bridge.
- Surveys will occur prior to and at the end of the low flow period as well as one or more later surveys to monitor the survival of any germinated plants.

Part 3 – Nursery seedbank experiment

This represents part of an ongoing collaboration with the University of Melbourne and will occur at the Burnley campus.

- Collect river bed soil samples from sites identified above, during the first plant survey.
- Undertake a range of inundation treatments to replicate the autumn low flow scenarios, as well as control treatments, in a controlled environment.
- Germinants of each species will be counted and tracked for subsequent survival.

Timeline May 2022 to late 2022

Outputs

- **Initial Fact Sheet** (this document)
- **Intermediate Fact Sheet** following completion of the field surveys and initial nursery establishment.
- **Final Report** outlining the project background, methods, results, discussion and recommendations for management.

Outcomes

- Improved understanding of the recruitment requirements of instream plants and whether exposure of the riverbed during summer/autumn can trigger germination of these species.
- Improved understanding of how environmental flows can be best managed in the context of the broader flow regime to provide this germination trigger or the survival of germinants from low flow events.
- Specific advice for managers on how to inform seasonal and annual watering decisions to benefit instream plants given the previous outcomes.

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Seedlings of multiple riparian species germinating on the exposed Campaspe River bed near Barnadown.