

Birrarung's billabongs: vegetation response to environmental watering



Healthy Waterways
Strategy 2018-2028
Port Phillip & Westernport, Victoria



Melbourne
Water



Strategic alignment

Regional Performance Objectives (RPOs):

- RPO 12: Water for the Environment continues to be managed and delivered to the region's rivers and wetlands and recovery options continue to be investigated.
- RPO 1: Traditional Owners and Aboriginal Victorians have an increased expertise in contemporary land and waterway management, waterway science and lore.
- RPO 6: Partnerships are fostered between Traditional Owner groups and research groups, and Traditional Owner groups and community groups

Key Research Areas:

- Hydrology and environmental flows: Improving our understanding of the responses of key environmental values to flow regimes to refine our environmental flow objectives
- Streamside vegetation and instream habitat: Identifying critical constraints to revegetation success and opportunities to improve vegetation outcomes

Summary

Many billabongs within the Greater Melbourne area have been lost to recent human impacts. The few remaining billabongs along the lower Birrarung (Yarra River) retain important ecological, social and Indigenous cultural values. Melbourne Water has identified priority billabongs and developed management plans to support and enhance such values including environmental watering.

A collaboration between Melbourne Water, The University of Melbourne and the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation's Narrap Unit, this project entails a monitoring program to assess the vegetation response to natural and managed flood events of Birrarung's billabongs to refine recommended water regimes and inform their adaptive management.

Floodplain wetlands (or billabongs) rely on connectivity with their parent river, with regular flooding via overbank flows driving their ecological function (Junk et al. 1989). However, many of Australia's billabongs have been artificially disconnected via channel modification and flow regulation. Birrarung's billabongs are no exception with flooding via overbank flows occurring much less frequently today than under natural flow regimes.

The resulting lack of flooding encourages invasion by terrestrial and exotic plant species (Catford et al. 2011). While

environmental watering of billabongs has the potential to suppress exotic plant species and promote native wetland vegetation (Duong et al. 2018), potential benefits of environmental watering in urban areas may be constrained by habitat degradation, high weed loads and poor water quality.

As part of Melbourne Water's 'Billabongs' program, several priority billabongs along the lower Birrarung have been identified and investigated for their potential rehabilitation via environmental watering. Broadly, the vegetation objectives of the waterings are to rehabilitate native herbaceous wetland flora (Floodplain Wetland Aggregate EVC 172) and riparian woodlands (Floodplain Riparian Woodland EVC 56). Recommended watering regimes have been developed to meet these objectives based on broad understandings of the flooding requirement of the vegetation communities. However, there is a recognised need to monitor the vegetation response to any watering events to inform the adaptive management of these significant sites (Boon 2010; Alluvium 2016; Jacobs 2017a; Jacobs 2017b). University of Melbourne researchers and Narrap Rangers have now jointly undertaken surveys of the vegetation response to flooding for the past three years.

Recommendations

- Adopt management plans aimed to achieve flooding of these billabongs in at least 2 out of every 3 years to promote native wetland vegetation and the condition and reproductive output of River Red Gums.
- Longer duration flooding (up to 8 months) is preferable because it further increases the condition of River Red Gums and suppresses the cover of terrestrial weeds.



Figure 1. Delta Freedman of Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation's Narrap Unit discussing Wurundjeri people's connection to and experiences on Country at Bolin Bolin at a recent 'On Country' day.

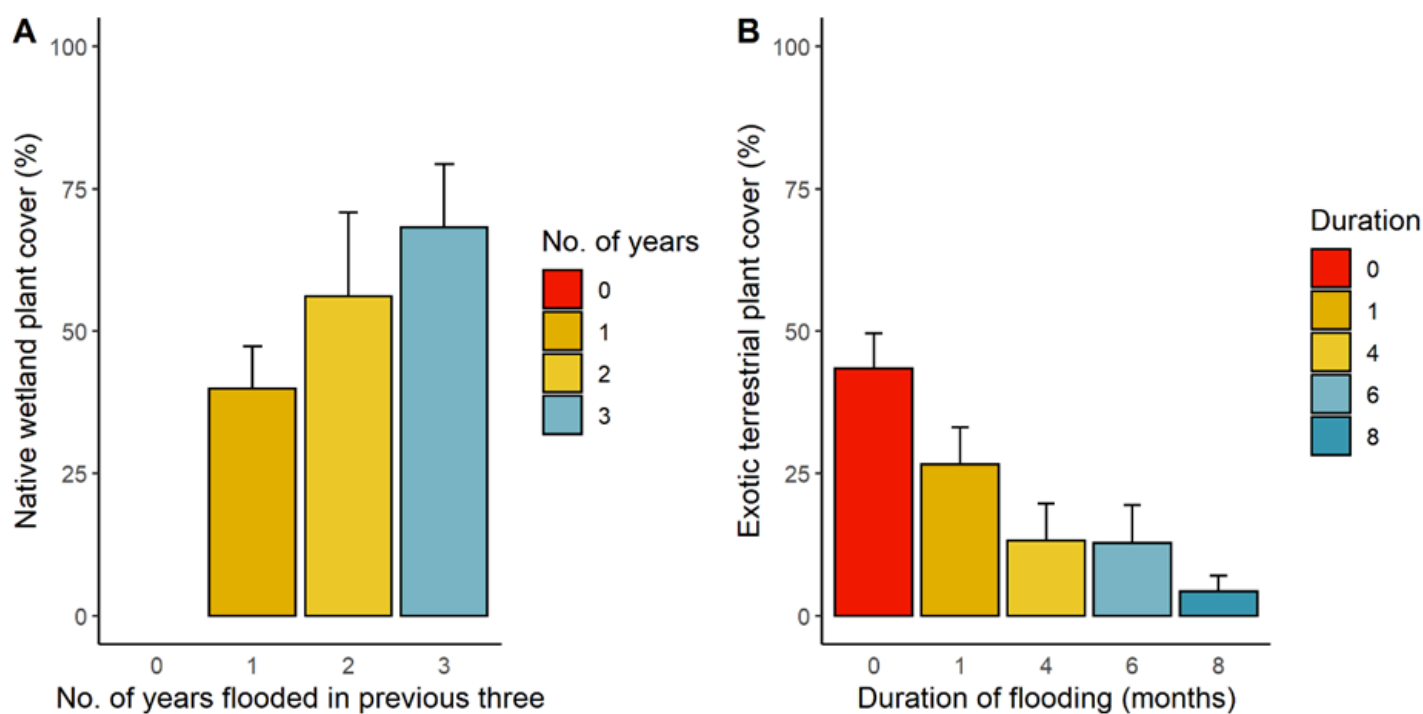


Figure 2. Relationship between native wetland plant cover and exotic terrestrial plant cover and flooding: A. Native plant cover increases with the number of times a billabong is flooded in previous three years; B. Exotic terrestrial plant cover reduces with longer durations of flooding (months prior to survey).

- Pursue long-term, self-sustaining and cost-effective solutions (e.g. lowered inlet level, treated stormwater inputs) for priority billabongs, where appropriate.
- Continued monitoring and research of vegetation (and other biota) at billabongs to be led by Wurundjeri's Narrap Unit to strengthen understanding of the water requirements of these significant sites and further Traditional Owner-led management of Birrarung's billabongs.
- Annual 'On Country' workshops with Wurundjeri Woi Wurrung Corporation's Narrap Unit and other stakeholders be held to discuss how best to manage these culturally significant sites and increase Wurundjeri's role in their management.
- For the Traditional Owners, the Wurundjeri Woi Wurrung people, to develop a leading role in the management of billabongs along the lower Birrarung.
- Recording incidental frog activity, using the Frog Census App. These surveys have been conducted at timing of spring and summer surveys of understorey vegetation.
- Collecting eDNA samples according to appropriate protocols when water is present, including investigating the potential for eDNA techniques to be used to identify wetland plant species.

Further to the ecological monitoring, this project has sought to further the role of the Traditional Owners, the Wurundjeri Woi Wurrung people, in the management of Birrarung's billabongs. To further this aim, annual 'On Country' days are held with the full Narrap Unit and other relevant stakeholders to share knowledge and strengthen Wurundjeri participation and leadership in collaborative research and management of Country (Figure 1).

What did we find?

Joint undertaking of vegetation surveys at several billabongs along the lower Birrarung by Waterway Ecosystem Research Group researchers and Narrap Unit Rangers increases Traditional Owners expertise in contemporary land and waterway management and science. This project offers a great example of effective collaborative research with Traditional Owners that supports our progress towards HWS Regional Performance Objectives (RPOs) such as RPO-1 (Traditional Owners and Aboriginal Victorians have an increased expertise in contemporary land and waterway management, waterway science and lore) and RPO-6 (Partnerships are fostered between Traditional Owner groups and research groups, and Traditional Owner groups and community groups).

Natural flooding or environmental watering events (even of short duration) have clear benefits for billabong vegetation. At billabongs that flood more regularly and for longer durations there is greater cover of native wetland plant species and the cover of exotic terrestrial weeds is lower (Figure 2).

What did we do?

Seven priority billabongs were selected with varying levels of connectivity to the Birrarung both with and without planned environmental watering events: Annulus, Banyule, Bolin Bolin, Burke Rd, Horseshoe, Montpellier, and Willsmere billabongs.

Monitoring of the changes in vegetation involved two principal methods:

- To assess understorey vegetation changes, 3–5 permanent 10m x 10m quadrats were established at these sites. These quadrats have been surveyed in spring and summer from 2019–22, pre- and post- any watering or timing of likely natural flooding.
- 20–30 large old River Red Gums growing along each of the billabongs have been identified, mapped and surveyed for tree condition and flowering in the summers of 2020–22.

The project is also monitoring faunal responses to watering regimes, by:

However, in the absence of flooding, terrestrial vegetation may recover rapidly and become dominant within two years. Repeated flooding/watering events are necessary to substantially reduce the weed seed loads at urban billabong sites that now flood infrequently.

As flooding duration increases, so does the condition of River Red Gums, while flooding (irrespective of duration) dramatically increases the subsequent flowering of the River Red Gums and thus nectar availability for fauna (Figure 3).

Future direction and Knowledge gaps

Recent discussion during On Country Day gatherings have led to development of plans for an ARC Linkage grant application to further investigate past (e.g. analysis of sediment cores to understand historical wetting and drying cycles, vegetation communities and fire regimes) and enhance future Wurundjeri-led management of Birrarung's billabongs.

The expansion of the project to include eDNA sampling to investigate vertebrate fauna use and vegetation communities of these sites also demonstrates the growth of this project as well as the desire of Traditional Owners and water managers to better understand to use of these sites by fauna including important totemic species.

How are we sharing findings?

MWRPP Reports

- No. 22.4: Billabongs of the lower Birrarung: vegetation responses to flooding. Joe Greet and Narrap Unit Rangers.
- No. 21.4: Billabongs of the lower Birrarung: native wetland vegetation responses to watering 2020/21. Joe Greet and Narrap Unit Rangers
- No. 20.2: Billabongs of the lower Birrarung: native wetland

vegetation responses to watering. Joe Greet

Additionally, work from this project has been presented at a range of internal and external forums, including the HWS Forum and 'On Country' field days and workshops.

References

- Alluvium (2016) Billabong priority planning and water delivery options: Burke Rd and Willsmere Billabongs. Report for Melbourne Water
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- Duong A, Greet J, Walsh CJ and Sammonds MJ (2018) Managed flooding can augment the benefits of natural flooding for native wetland vegetation. *Restoration Ecology*.
- Jacobs (2017a) Banyule Billabong - conceptualisation and options assessment. Report for Melbourne Water.
- Jacobs (2017b) Bolin Bolin Billabong - conceptualisation and options assessment. Report for Melbourne Water.
- Jensen AE, Walker KF and Paton DC (2008) The role of seedbanks in restoration of floodplain woodlands. *River Research and Applications* 24, 632-649.
- Junk WJ, Bayley PB and Sparks RE The flood pulse concept in river-floodplain systems. In 'Proceedings of the International Large River Symposium', 1989, pp. 110-127

For more details on the research outcomes of this project, or other projects of the MWRPP, please contact:

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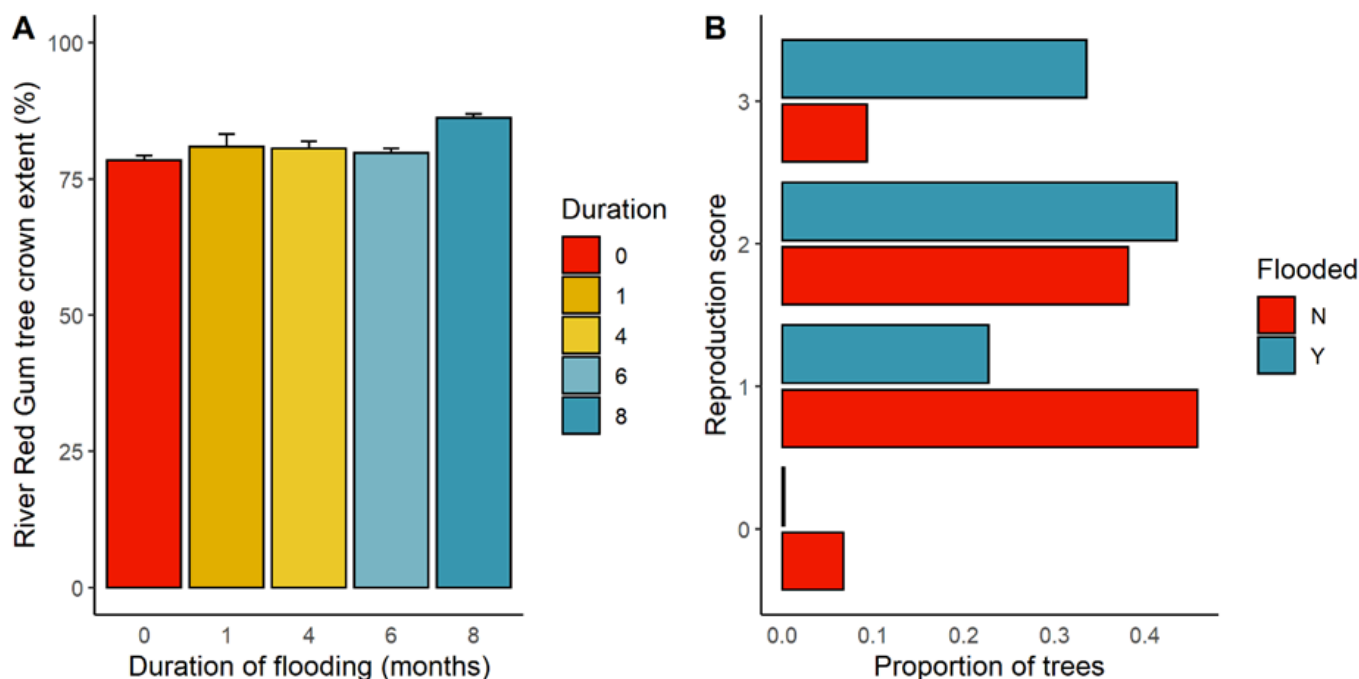


Figure 3. Relationships between tree condition (crown extent %) and reproductive output (abundance of buds, flowers and cones) of River Red Gums at six billabongs and flooding history: A. Tree condition increases with duration of flooding (months prior to survey); and B. Flooding (irrespective of duration) dramatically increases subsequent reproductive output