

Vegetation management and hydrological restoration of Bolin Bolin Billabong, Victoria

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Background

Billabong wetlands comprise some of the most endangered ecosystems in Victoria. Damming and regulation of most major river systems has greatly reduced the capacity of lowland streams to flood onto adjacent plains, often leaving billabongs stranded and dry. Unless more focus is given to these highly significant icons, they are likely to become increasingly degraded and modified over time.

Bolin Bolin Billabong is a wetland situated in the middle Yarra floodplain at Bulleen, approximately 10 km north-east of Melbourne. The billabong is of high cultural significance to the Wurundjeri people, who formerly gathered at the wetland for intertribal meetings and ceremonies. The site has outstanding natural values and supports disjunct rare plant species, many old-growth River Red Gum (*Eucalyptus camaldulensis*) trees, a high diversity of bat species and one of the most diverse and intact bird communities in the inner city.

Bolin is one of only several billabongs remaining from at least 50 that were formerly scattered along the Chandler Basin, a floodplain basin of the lower Yarra River formed by an ancient lake system. In the early days of European settlement wetlands were seen by many as unclean and disease ridden areas, and most of the billabongs were filled in to utilise the ground for agriculture, roads and sports fields. Groundwater was drained to make way for agriculture and several of the billabongs were used as tip sites and filled with garbage.

Of the several remaining billabongs, Bolin is the only wetland whose bathymetry and vegetation has not been significantly modified, although the hydrological processes that determine its wetting and drying cycles have been greatly altered. The Yarra River was originally a perched stream that flowed through a complex of swamps and billabongs which would fill regularly when the Yarra spilled its banks (Beardsell, unpublished information). However by the late twentieth century the base level of the Yarra River had dropped severely due to groundwater drainage and river regulation, and the wetland now floods irregularly.

Under 'natural' conditions Bolin would receive regular overbank flows from the Yarra, resulting in near annual inundation and permanent open water existing in all but extended drought periods. Under current conditions a

severe reduction in the higher flow events has increased the likelihood of the billabong drying out and remaining dry over long periods, thus favoring terrestrial species, particularly weeds, over native aquatic and semi-aquatic plant species.

By the late twentieth century Bolin had been greatly impacted by agricultural practices and weed invasion. Cattle were present in the wetland until recently, pugging the banks and grazing sensitive aquatic herbfields. Weeds had invaded much of the site, and Wandering Tradescantia (*Tradescantia fluminensis*) and Blackberry (*Rubus fruticosus*) blanketed large areas. This highly modified habitat was now unsuitable for many ground foraging birds and restricted recruitment of native plant species. The surrounding floodplain had been mostly cleared and developed, although Bolin still retained a relatively intact canopy and shrub layer.

Early management and research

In the 1990's, Parks Victoria began a program of restoration that continues to this day. First the Blackberry and Wandering Tradescantia thickets were removed with herbicide, as the extent of these weeds was too great to tackle by hand. Areas that were previously cleared were planted with a range of trees and shrubs, which increased the extent and quality of habitat.

During this time research projects were undertaken to document the billabong's botanical composition and investigate its current hydrological regime. It was found that Bolin supported an assemblage of rare plant species, many that are of disjunct occurrence and more common in northern Victoria, including Matted Water Starwort (*Callitriche sonderi*), Matted Starwort (*Stellaria caespitosa*) and Short-fruit Nardoo (*Marsilea hirsuta*). Hydrological studies concluded the billabong was flooding far less than historically, and an appropriate flooding regime was recommended.

Another study that involved analysis of a core sample taken from the Billabong (Paul *et. al.* 2002) found that sedimentation rates had increased up to 30 times since European settlement. This is probably due mostly to river regulation, as the Yarra now spills its banks into Bolin only during big flash-flood events, which bring large volumes of silt and turbid water.



Wandering Tradescantia (Tradescantia fluminensis) flower (left) and smothering vegetation (right).
 Photos: © RCH Shepherd (www.weedinfo.com.au), APIL, ANBG.

Intensive restoration

In 2004 an intensive program of vegetation management was begun by Parks Victoria ranger Cam Beardsell. The program, begun shortly after the Yarra flooded into Bolin in December 2004 and in February 2005, included hand weeding of exotic grasses and herbs in the northern bay of the billabong, which supported the highest density of rare native flora. Although removal of Wandering Tradescantia and Blackberry had many positive effects, they were replaced by an equally threatening assemblage of exotic herbs and grasses which began to proliferate in the post-flood conditions. Many days were spent hand-weeding with several volunteers, until the northern bay was almost completely weed free.

During these works additional rare flora species were discovered, many of which are absent or known only from very few other occurrences in the Melbourne region, and demonstrate biogeographic affinities with the Murray River floodplain. Seed collected from several of the most localised species was grown by the Friends of Yarra Parklands nursery and used to enrich the current populations at Bolin.

Drying

At the time of writing in 2010, the billabong is completely dry. Dense thickets of River Red Gum are establishing in its floor in areas normally occupied by aquatic herbfields, while all of the most significant plant species have temporarily died off in the northern bay. After so many years of drought and river regulation, the river hasn't flooded for five years with no promise it will occur anytime soon. Localised plant extinctions may eventually occur and the regenerating River Red Gums may establish permanently, drying the soil further and altering light conditions.

Hydrological restoration

In the midst of these dire conditions, Parks Victoria and Manningham Council are currently working on an exciting stormwater harvesting project to restore the natural hydrological regime to the billabong. The current plan is to initially pump water into it from the river, using screens to prevent colonisation by European Carp which severely impact aquatic vegetation. Once the billabong is full, the water level will be maintained by allowing entry of treated water from stormwater wetlands to be constructed nearby. The stormwater will be regulated so that the natural regime of flooding and drying can be maintained thus delivering significant biodiversity enhancements to the billabong.

Conclusion

The processes that have eliminated and degraded billabongs of the Chandler Basin operate across floodplains throughout Victoria and Australia. The management works at Bolin Bolin Billabong span at least 20 years and act as a model for restoration of billabongs elsewhere. The works that continue to progress have secured this wetland as one of the greatest jewels of the Yarra River.

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