Unlocking the self-sustaining restoration potential of drained wetlands

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Abstract

The great opportunity presented by addressing water management as a restoration method at strategically selected former (drained) wetland sites is the ability to trigger a self-sustaining spontaneous process of habitat recovery. The goal of this approach is to unlock the natural regeneration potential of wetland flora and fauna species that are adapted to respond to dynamic hydrological conditions. In some circumstances inundation can provide excellent natural weed control and reduce competition, while simultaneously promoting an aquatic vegetation response – making rapid improvements in ecosystem condition possible. This paper provides practical examples of where this approach has been successfully employed by Nature Glenelg Trust in South Australia and Victoria and the broad range of benefits (which extend far beyond ecology) that have resulted from the projects undertaken in recent years.

Introduction

Nature Glenelg Trust (NGT) is a charitable, not-for-profit environmental organisation operating in south-eastern Australia, with a particular emphasis on wetland restoration enshrined in its charter. NGT has worked on a wide range of wetland restoration projects across both private and public land in south-eastern South Australia and western Victoria, two regions that have suffered a severe decline in wetland extent, with over 90% and 60% respectively lost since European settlement. The drivers of this change (to water resources and wetlands) are multiple and complex. They include: climatic trends, plantation establishment, urban and rural development, water extraction for irrigation, and perhaps most importantly, artificial drainage. Crucially, while some of these factors either can't be managed or take protracted timeframes to influence, drainage is usually the most feasible threat to manage with demonstrable immediate results. This paper shares NGT's experience at case study sites, using the logic and tools of wetland restoration to illustrate self-sustaining habitat recovery in practice.

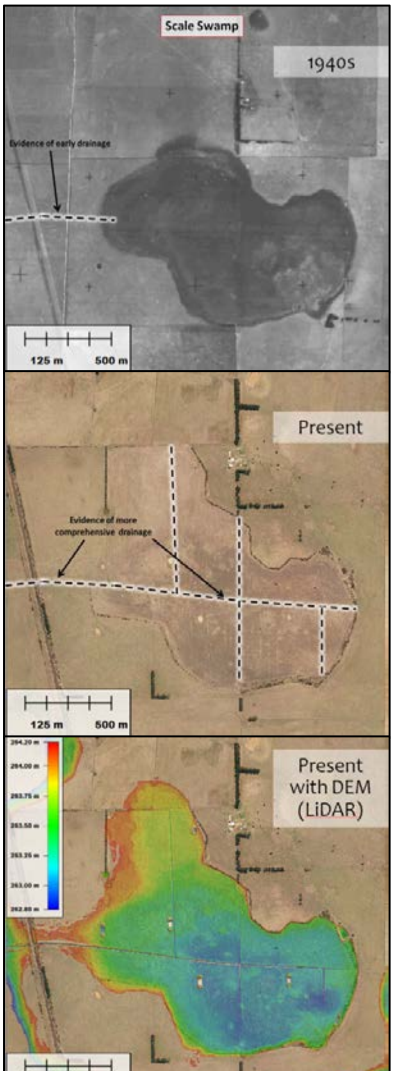

Fig. 1. Tools for restoration planning at Scale Swamp, Victoria. Historic / modern aerial imagery and use of a Digital Elevation Model.

The logic of wetland restoration

Comprehensive artificial drainage on private land for agricultural development has left many former wetland features in a highly modified or degraded state. One attempt to remediate such areas includes a large-scale, long-term hydrological restoration project within the Piccaninnie Ponds wetland system of SA (Bachmann 2016). One of the components of the project was the successful restoration of former farmland at Pick Swamp; a site that was purchased for addition to the neighbouring Conservation Park in 2005. Restoration commenced with the backfilling of drains in 2007 and the property quickly responded, with an immediate and spontaneous recovery of aquatic flora and habitat. This process of 'just adding water' culminated in the area being recognised as part of Australia's newest Ramsar site (Piccaninnie Ponds Karst Wetlands) in 2012.

The tools of wetland restoration

While the recovery of the natural water regime is the ultimate goal for wetland restoration projects, there are a number of important steps and information requirements that need to be considered. This includes evaluating important background information such as:

- site history, tenure and number of affected landowners;
- current condition, remnant values and predicted response;
- location in catchment and water security; and
- configuration of artificial drainage.

Aerial imagery and digital terrain modelling (based on LiDAR data) form the basis for assessing development history and running predicted inundation scenarios, and are also a critical tool for communicating expected impacts to stakeholders and designing intervention works. Fig. 1 illustrates this method for one of the case study sites, Scale Swamp.

For situations with a high degree of uncertainty, designs can be tested and refined using trial measures to test assumptions through 'learning by doing', such as constructing geo-fabric sandbag weirs. In other situations, where a consensus exists and confidence levels are high, immediate permanent earthworks or concrete structures can be installed. The key consideration that governs the process is the fact that every site is different, with its own particular set of circumstances that require proper investigation, before formulating a proposed restoration response and works. Three examples of NGT projects showing site characteristics where different methods have been used to achieve restoration are summarised in Table 1.

Table 1. Evaluation of three NGT restoration sites.

Characteristic	**Scale Swamp (Vic)**	**Green Swamp (Vic)**	**Mt Burr Swamp (SA)**
Tenure	Private	Private & Public	Private
Catchment location	Top of closed catchment	Mid-catchment in a wider drainage network	Top of catchment
Nature/impact of artificial drainage	Comprehensive (>50 yrs), minor seasonal inundation	Sill level lowered (<10 yrs), deepest areas still inundate	Comprehensive (>25 yrs), minor seasonal inundation
Historic aerial images	1940s	1940s	1950s
Confidence in predicted inundation extent and water security	High	High	High
Agreement from affected neighbours	Yes	Yes	N/a
Other design considerations	Need for stock crossing	Need to accommodate passing flows	Need to manage level during property transition
Chosen restoration method to reverse artificial drainage	 Earthen block, with track	 Levee and concrete spillway	 Adjustable sandbag weir
Immediate ecological response	Yes – waterfowl and native replacement of exotic plants	Yes – including threatened species	Yes – including threatened species

Discussion

Thanks to the persistence of a remnant seed bank and/or rhizomes (and no history of cropping), spontaneous aquatic ecological recovery has taken place at all three case study sites, and two of the sites are known to support populations of *EPBC Act* listed species. The recovery of habitat at Mt Burr Swamp after drain regulation in August 2016, is shown in Fig. 2 (right) facilitating an immediate recovery of a bed of Water Ribbons (*Triglochin procerum*), habitat favoured by the Growling Grass Frog (*Litoria raniformis*). Indeed the immediate response of this nationally threatened amphibian to restoration works has already been recorded (Bachmann 2017). However, the capacity for rapid ecological recovery is only a part of the wider story of wetland restoration benefits, which include: aquifer recharge and water retention in the landscape, buffering against climate variability/change, water filtration, flood buffering, aesthetics and recreation, and for sharing stories of hope in a time of growing environmental despair.

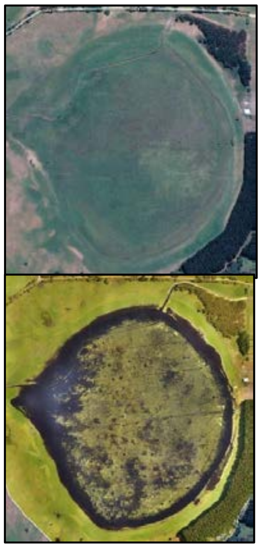

Fig. 2. Restoration of Mt Burr Swamp, SA. Aerial imagery from Dec 2015 to Nov 2016.

Conclusion

At strategically selected sites in degraded landscapes, wetlands are capable of rapid, self-sustaining ecological recovery. The potentially higher up-front land or opportunity costs are usually offset by fast environmental returns and lower ongoing investment in maintenance. In summary, water is an excellent medium for restoration – both literally (as demonstrated), but also conceptually – because it forces us to think outside of linear boundaries and pushes beyond the limitations often encountered with terrestrial restoration. Using water as a restoration tool, natural processes can have great effect.

References

Bachmann MR (2016) Restoration journey of the Piccaninnie Ponds Karst Wetlands, South Australia. *Ecological Management and Restoration.* Vol 17, No 2, 102–111.

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