

Box 1: Perverse outcomes of environmental watery delivery.

Environmental water is an accepted means of rehabilitating stressed wetlands and ensuring completion of breeding in fish, frogs and waterbirds. Flow delivery can be a balancing act between needs and risks. Environmental flows delivered to wetlands can sometimes have perverse effects that jeopardize their intended aims. Since the early 1990s, environmental flows have been delivered to the nationally important Booligal Swamp and the terminal wetlands of Merrimajeel and Muggabah Creeks in the southern Murray-Darling Basin. The environmental flows are delivered in spring-summer to support colonial-nesting waterbird breeding. For the first ten years of this management action, water for consumptive use (stock, domestic, irrigation) was also delivered at this time, and rejected irrigation deliveries (i.e. requested irrigation water not extracted from the creeks) occur during spring-summer too. Although waterbird recruitment benefits from summer flows, these creeks historically ("naturally") experienced low or no flows in summer. As a result of unseasonal high flows, vegetation productivity increased in the effluent channels, blocking water passage and inadvertently limiting the delivery of environmental water to the wetlands, as well as water for human use.

The current water management regime, developed since the early 2000s, mitigates these effects by delivering more consumptive water during colder months, and through structures that stop unseasonal flows. However, delivery of environmental flows into Booligal Swamp for late breeding birds, such as glossy ibis (*Plegadis falcinellus*, Driver *et al.* 2010), will continue to alter the timing of flows beyond the historic range, and promote overgrowth of several emergent macrophytes (e.g. *Typha* species) and lignum (*Duma florulenta*). Manual 'creek cleaning' to remove this vegetation and associated silt often results in further growth of lignum shrubs, which appear to respond favourably to mechanical disturbance. The timing of flow delivery is therefore a critical consideration in this situation for meeting both ecological and socio-economic objectives.



Lake Merrimajeel, February 2014 (Credit: Patrick Driver).

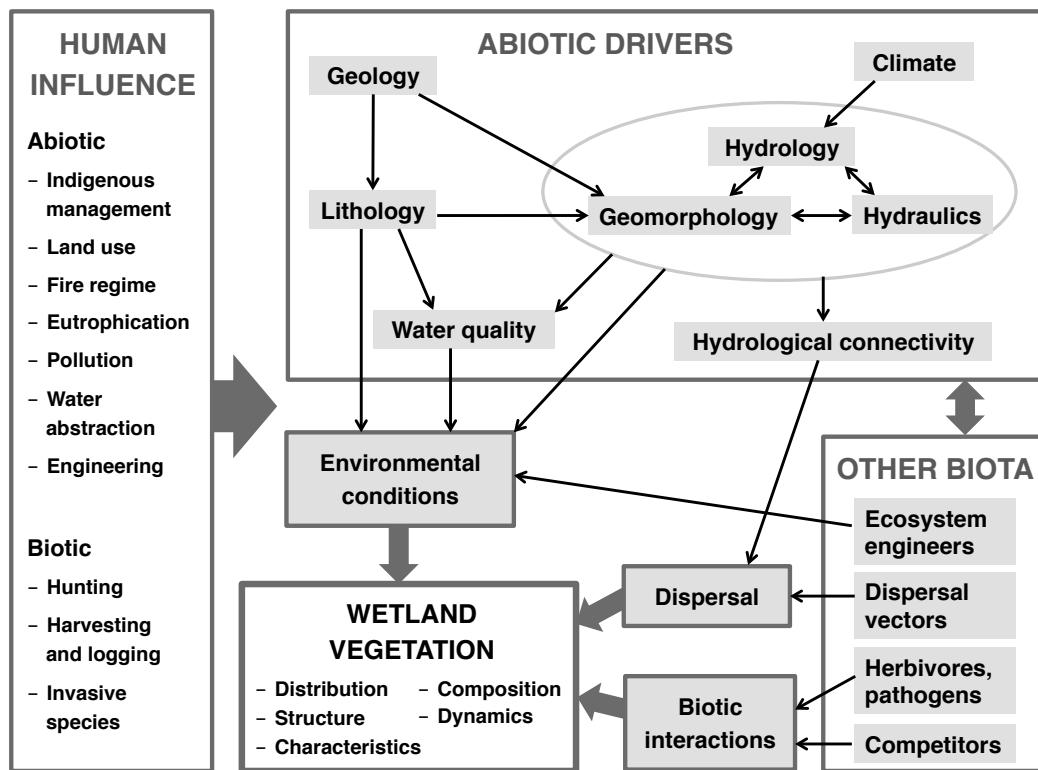


Figure 1



Figure 2

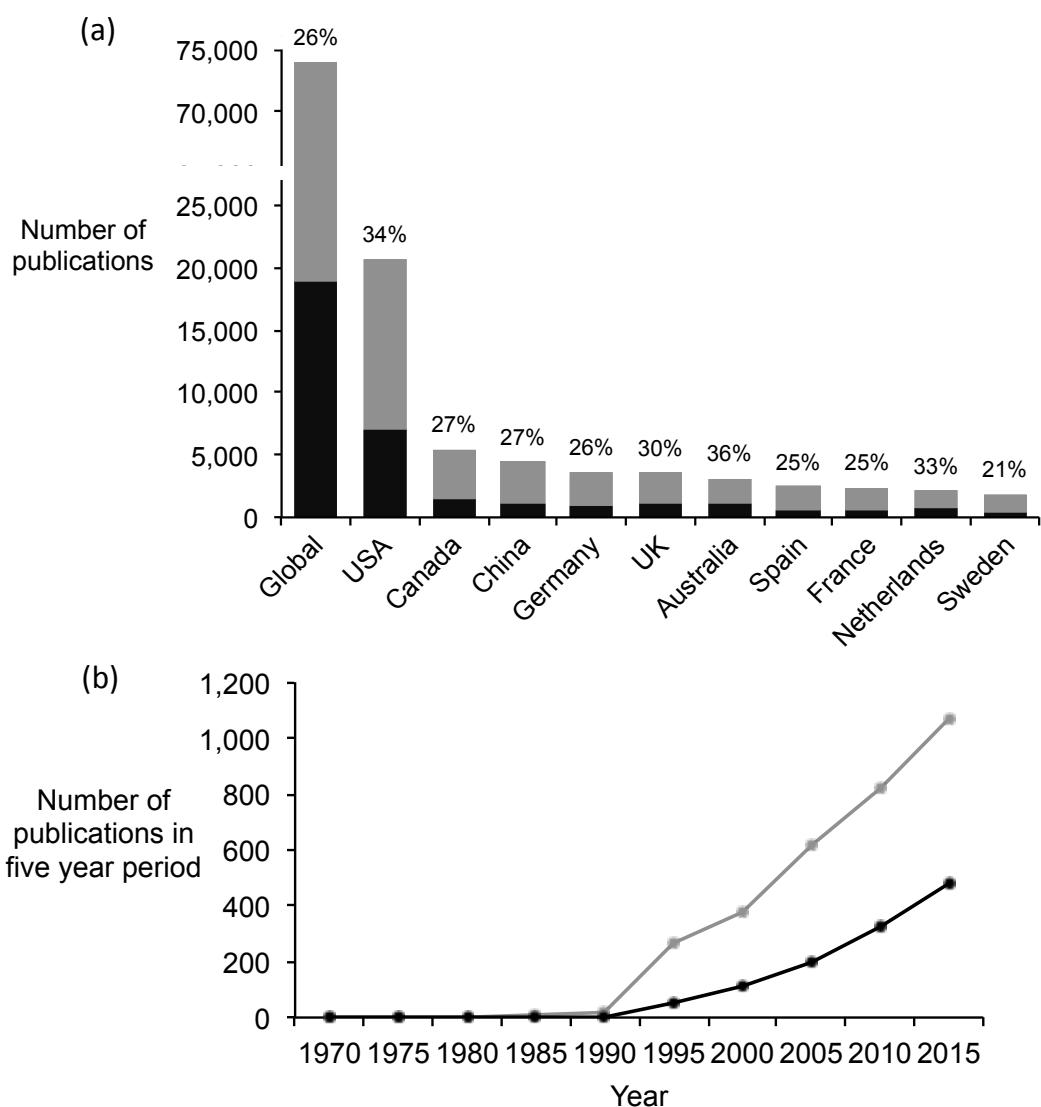


Figure 3

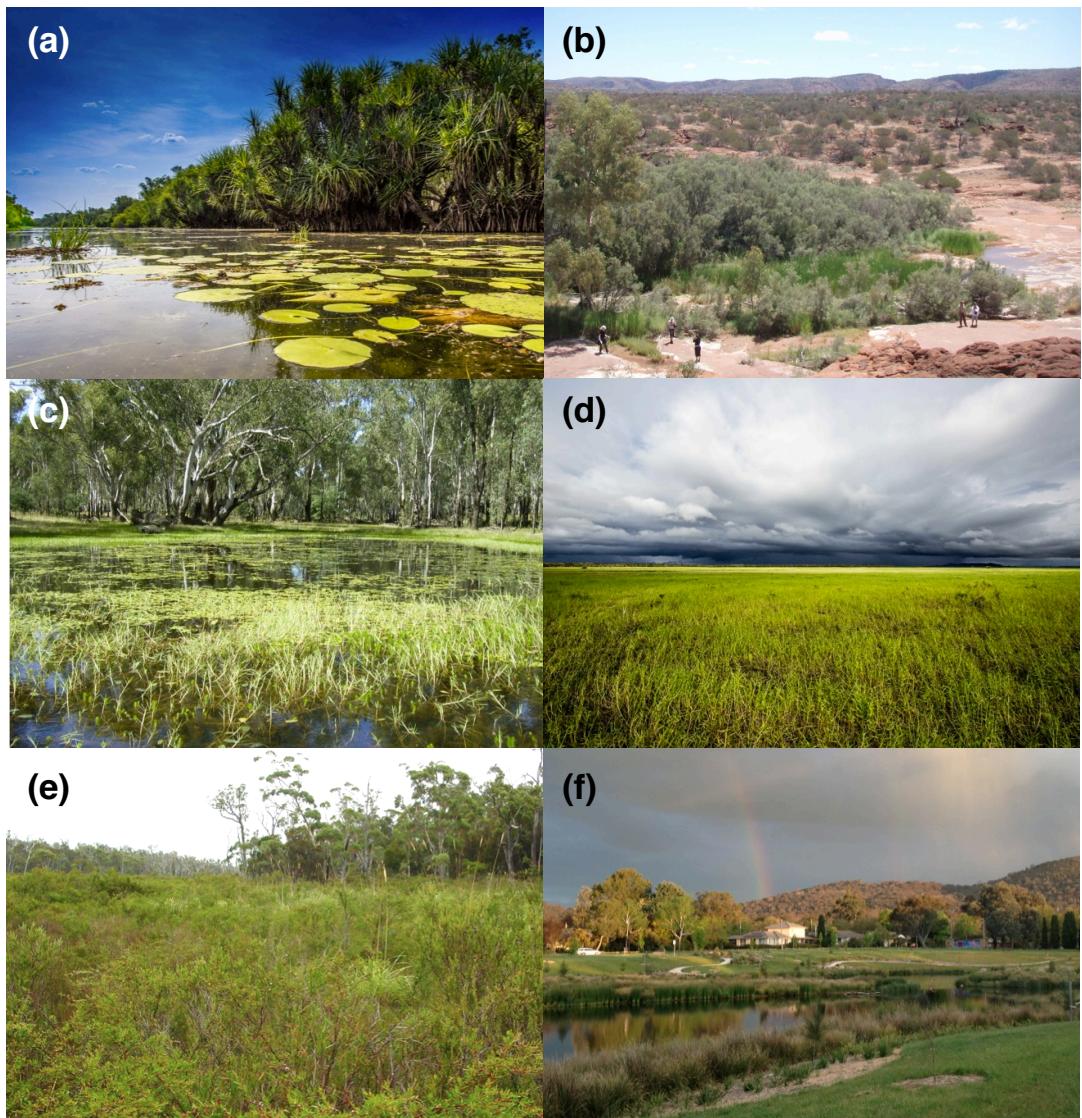


Figure 4