DISCUSSION

In this thesis I explored how natural and altered environmental conditions shape the ecology of riparian plant communities. In this final chapter I aim to summarise the contribution of my thesis as a whole to the greater body of riparian plant ecology and river restoration research, and present some possible avenues for future work.

*Biogeographic context*

The riparian plant communities described here were located primarily along coastally drained, mid-catchment rivers in partially constrained valley settings, spanning temperate and subtropical south-eastern Australia. A map showing field sites surveyed in Chapters 2-4 is shown below. Although no systematic review has summarised ecological knowledge of Australian riparian plant communities, more research attention appears to have been focused on semi-arid, inland-draining systems such as the Murray Darling Basin, or larger tropical rivers, than these smaller coastal systems.

Additionally, much of the canonical riparian plant ecology literature was written about alluvial river systems in Europe and North America (Nilsson et al. 1989; Naiman and Decamps 1997; Tabacchi et al. 1998; Naiman et al. 2005; Corenblit et al. 2007). Flow regimes in south-eastern Australia diverge considerably from this canon: the seasonal regularity which characterises nival European and North American rivers is often replaced by substantial year-on-year variability (Finlayson and McMahon 1988; Peel et al. 2004). South-eastern Australian plants do exhibit characteristic species-level responses to seasonality, although there is no general coordination of growth and reproduction phenologies as in the Northern Hemisphere (Ford, Paton & Forde, 1979). As such, Australian riparian plant communities are likely to be adapted to different environmental controls. In common with North American systems, however, the signature of rapid landscape modification has been etched deeply into fluvial landscapes. Many rivers have undergone irreversible state transitions following European settlement (Knopf et al. 1988; Fleischner 1994; Wasson 1994; Brierley et al. 1999), and the mid-20th century saw the rise of extensive flow impoundment schemes in both continents (Lloyd et al. 2004; Graf 2006).

This body of work therefore contributes some fresh perspective to the global literature, from species pools subject to a different evolutionary history and operating under different environmental conditions to the most commonly described riparian ecosystems.



Figure 1. Map showing geographical distribution of field sites from Chapters 2 & 3 (blue) and 4 (yellow) (Google Maps 2015).

The specific contributions of this thesis are best described according to the following themes: 1.) ecological responses to environmental heterogeneity, 2.) plant functional ecology, 3.) river restoration and riparian management.

*Ecological responses to environmental heterogeneity*

Organise discussion into themes:

* Introduce themes
* The relationship between environmental heterogeneity and diversity
  + Since Who?, understanding of diversity in terms of EH has been a mainstay of modern ecology
  + My work confirms importance of hydrological heterogeneity in shaping riparian plant assemblages
  + BUT it doesn’t appear to be equally important in all regions (all?)
  + More study of tropical river systems / developing world, and temperate systems from other regions e.g. NZ, south America, eastern US, which aren’t dominated by *Populus*/*Salix* –type ecological strategies.
  + Do Australian plant communities have a unique relationship with flow heterogeneity?
    - The Gondwanan species pool in Australia has evolved under a unique set of conditions, most notably the gradual transition towards aridification with the lack of extensive glaciation during recent global glacial maxima.
    - Radiation of Myrtaceae, Ericaceae, Protaceae, Fabaceae - replacement of less stress tolerant clades
* Functional ecology
  + Riparian veg communities are great models systems for studying environmentally controlled community assembly due strong fluvial control on resource and energy gradients.
  + We found evidence that ecological strategies and associated trait syndromes strongly selected for flow response.
  + WD literature & fast / slow strategies
  + Tie-ins with disturbance ecology, invasion ecology
* Management
  + Multiple drivers of community assembly
    - Reign of hydrology (confirmation)
  + Environmental flows
    - What’s my contribution to the env flows literature?
    - Could env flows realistically have a predictable effect on diversity in these systems?
    - Do fine-grained species specific studies need to be done?
  + Biodiversity / resilience / ecosystem functioning / ecosystem services
  + Climate change
  + Invasion
  + Quantitatively derived flow-response guilds