Since the MacArthur brothers’ pioneering observations that bird species diversity tracked diversity of habitat foliage height (MacArthur and MacArthur 1961), environmental heterogeneity has come to be understood as an important driver of patterns of biodiversity (Stein et al. 2014).

understanding of biodiversity in terms of EH has been a mainstay of modern ecology (stein).

The relationship between environmental heterogeneity and biodiversity has been a key concern of ecologists since the early 1960’s (MacArthur and MacArthur 1961; Stein et al. 2014).

The relationship between environmental heterogeneity and biodiversity has been a key concern of ecologists since the MacArthur brothers’ pioneering observations that bird species diversity closely tracked diversity of habitat foliage height (MacArthur and MacArthur 1961)

This chapter adds to what is currently an embryonic corpus of work describing the use functional traits to quantitatively characterise relationships between flow regime and ecological strategy in riparian plant communities.

* The relationship between environmental heterogeneity and diversity
  + Since the MacArthur brothers’ initial observations that bird species diversity tracked diversity of habitat foliage height (MacArthur & MacArthur 1961; Johnson & Simberloff 1974;), understanding of diversity in terms of EH has been a mainstay of modern ecology (stein). Riparian landscapes considered useful model systems due to strong environmental control, environmental filtering etc.. Therefore importance of hydrologically driven EH has been the dominant paradigm in riparian plant ecology ( Naiman & Decamps and Tabacchi)
  + MacArthur, R. & MacArthur, J.W. (1961). On bird species diversity. Ecology, 42, 594–598.
  + Johnson, M.P. & Simberloff, D.S. (1974). Environmental determinants of island species numbers in the British Isles. J. Biogeogr., 1, 149–154
  + My work confirms importance of hydrological heterogeneity in shaping riparian plant assemblages
    - Briefly summarise what I found in each paper.
      * WD literature & fast / slow strategies
      * Ch 3 and 4 used functional diversity
    - 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, Casuarinaceae - replacement of less stress tolerant clades, retreat of rainforest assemblages to refugia
  + Future research:
    - In Ch4, FD was somewhat enhanced by EH, but negatively predicted by
    - Chapter 4 raises the question: what is the relationship between EH and resource & energy availability as controls on riparian plant communities?
    - Are they opposing forces? (provide some examples of metrics showing how this could be the case)
    - Or is a dimensional model a better way of conceptualising things?
      * Provide some examples of metrics
      * If so, how orthogonal are the axes?
      * What metrics might best describe one but not the other?
    - Or is the whole thing an *issue of spatial scale?*
    - Need some research that frames questions around these issues of resource availability vs EH, and treats scale explicitly.
      * Smith, T.W. & Lundholm, J.T. (2012). Environmental geometry and heterogeneity–diversity relationships in spatially explicit simulated communities. J. Veg. Sci., 23, 732–744.
    - Is there something makes subtropical/tropical communities inherently different from temperate - is it something to do with species assemblages and differing evolutionary histories (i.e. differential adaptation to EH)?
* 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.
  + Tie-ins with disturbance ecology, invasion ecology
* Multiple drivers of community assembly
  + Reign of hydrology confirmed (all chapters)
* Anthropogenic variables
  + CO2
    - Further work?
  + Role of flow modification? Land use?
    - Further work?

Our research in south-east Queensland has less to say about the prospects for using environmental flows in more holistic efforts to conserve original species assemblages and their characteristic ecosystem functions and processes.

* *Communities are particularly sensitive to seasonal timing of low flows.*
* *Env flows are often designed to replace flow heterogeneity stripped from the system by dams*
* *Depending on what the goals are for designed flows (i.e. supporting indigenous species over exotic species, improving geomorphic condition and habitat complexity, maintaining or restoring lost ecosystem processes and services)*
* *Management*
  + Climate change
    - CO2, climate variability
  + 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
  + Invasion
  + Quantitatively derived flow-response guilds