Notes on SE QLD ELOHA study





****

**Hydro analysis**

44 sites, 20 rivers

East – west gradient in rainfall, but not really temperature. East dominated by rainforest, west dominated by dry sclerophyll. Some melaleuca swamp – might want to omit these?

Steve Mackay produced modelled ‘reference’ hydro data (using IQQM) model for every reach. He calls the actual gauge data ‘historic’ data.

He then calculates a Gower’s dissimilarity between reference and historic data to give an index of alteration.

All Gower’s dissimilarities were < 0.25, so the magnitude of hydrologic alteration in the region isn’t large, despite being pervasive (every site was altered in some way).

Some specific metrics exhibited large alterations: “The greatest changes have occurred in hydrologic metrics describing discharge magnitude, especially low-spell duration (increased), mean rates of rise and fall (increased), mean monthly discharge (decreased) and annual minima (decreased). Metrics describing flow frequency, duration, variability and timing also exhibit change from reference conditions.”

I wonder whether values were normalised by mean daily flow, and what would happen if I did this?

Every dam has been altered in a different way.

**Vegetation sampling methods**

Riparian vegetation field surveys were undertaken from 2008 to 2010. Initially, 28 sites were sampled from August to October 2008 with surveys of the remaining 16 sites completed in 2009 and 2010. Time constraints precluded completion of the entire survey within a single field season and splitting the sampling over two years rather than sampling across seasons within a year was deemed a more appropriate strategy for the riparian vegetation to avoid confounding potential seasonal effects. At each site, riparian vegetation was surveyed within three 50-metre-long transects randomly located perpendicular to a 100-metre stream section. To accommodate variation in vegetation densities, channel forms and adjacent land uses across study sites, sampling areas varied between 260 m2 and 1013 m2 with the sampling area for most sites being greater than 400 m2 as recommended by Walker and Hopkins (1984). All transects were conducted on the same side of the river to ensure any land-use impacts were similar.

All trees, shrubs, ferns, reeds, rushes and sedges ≥50 cm in height were recorded in a 5- metre-wide belt for each transect. Variables recorded included the species, distance from the water’s edge, canopy height, trunk diameter at breast height, the presence and composition of vines (both exotic and native) and a measure of plant health ranging from 0 (dead) to 4 (healthy with >75% canopy cover and little or no evidence of disease or insect damage). Densities of reeds, rushes (including mat-rush, Lomandra spp.) and sedges were also estimated.

**Stats**

Hypothesis 4, that hydrologic alteration will influence riparian vegetation patterns, was also tested using ANOSIM to examine tree and shrub assemblage composition between regulated and unregulated sites regardless of hydrologic class as well as within selected reference and historic hydrologic classes (Table 4.3). Regression techniques were also used to examine relationships between hydrologic alteration and riparian vegetation patterns. The Gower dissimilarity metric (see Chapter 2) was used as a measure of the overall degree of hydrologic alteration in this analysis.

**Veg communities**

Totals of 191 tree and shrub species and 43 vine species were identified (see the accompanying science report for a complete list). The most diverse sites were those on Currumbin Creek, Amamoor Creek, Yabba Creek and Stanley River, which each had more than 40 tree and shrub species. The four most abundant native species were Ficus coronata (sandpaper fig), Castanospermum australe (black bean), Cryptocarya triplinervis (three- veined laurel) and Syzygium floribundum (weeping lilly pilly). Exotic taxa comprised 23% of all individuals recorded with the most abundant exotic species including Celtis sinensis (Chinese elm), Lantana camara (lantana), Leucaena leucocephala (leucaena), Cinnamomum camphora (camphor laurel) and Ligustrum lucidum (broad-leaved privet).

Ordinations of the surveyed vegetation assemblage data (e.g. Figure 4.1) distinguished a number of broad riparian vegetation types. Drier, inland sites were typified by a relatively small suite of species including Grevillia robusta, Casuarina cunninghamiana, Melaleuca viminalis (Callistemon viminalis), Melaleuca bracteata and the exotic Celtis sinensis, while rainforest sites, particularly those of coastal creeks and to the north of the study region in the Mary River catchment, were typified by a diverse assemblage of rainforest species including several not generally considered obligate riparian species. Near-stream vegetation comprised a more limited suite of riparian species associated with rainforest vegetation types (both dry and wet rainforests) including Syzygium floribundum and Ficus coronata. However, even near-stream communities included some species that are typical of most rainforest types and not restricted to riparian zones (e.g. Guioa semiglauca and Cleistanthus cunninghamii).

**Results**

Furthermore, where comparisons between regulated and unregulated sites could be made within specific hydrologic classes (see Table 4.3), significant differences were apparent in the bankfull tree and shrub assemblage data in RFC 5 and HFC 2.

A significant effect of flow regulation was detected for two riparian vegetation metrics, including the density of reeds, rushes and sedges (D\_LOMAND) for which higher densities were found in all regulated sites than were predicted from regression models for unregulated sites. Species density (D\_SPECIES) was also lower in strongly regulated sites.

No evidence was found to support the hypothesis that increasing hydrologic alteration will result in predictable patterns of increasing biotic change, as proposed in the ELOHA framework.

Finally, evidence was mixed regarding the hypothesis that riparian vegetation species diversity has been reduced in regulated sites. Overall, species diversity was significantly lower in strongly regulated sites compared to unregulated sites. However, in contrast to the subhypothesis that reductions in species diversity will occur where hydrologic variability is reduced, higher species richness values were actually associated with low rather than high variation in dry season flows.

**Hypotheses for functional diversity study**

Reduced hydrologic variability is associated with reduced FD

Regulated reaches have lower FD than unregulated reaches

Reduction in FD is associated with extent of hydrological regulation