METHODS

The current study is an extension of a previous larger study (Arthington et al., 2012) conducted to test the ELoHA framework (Poff et al., 2010), and to determine hydro-ecological relationships to inform environmental flow management in south-east Queensland. Field data was collected between 2008 – 2010; the trait dataset was assembled and analyses described subsequently were performed in 2015. The report describing the original study provides extensive detail not included here (Arthington et al., 2012).

*Study area*

The study was conducted across seven catchments within coastal south-east Queensland, Australia. Sites were located between X and X degrees latitude and X and X degrees longitude (Table S1). The dominant land-use in the region is agriculture, with approximately 40 % of the area under grazing, and 4 % used for cropping. Urbanisation is also extensive, particularly along the coast. Native vegetation within conservation estate or state forest comprises 20 % of the study area, and additional native vegetation remnants are common in steep terrain. This study area has a subtropical climate, and is influenced by both tropical and temperate weather patterns. Little variation in temperature is present throughout the region, but a considerable longitudinal rainfall gradient exists: mean annual rainfall ranges from 800 mm in the west to 1400 mm in the eastern coastal catchments. The majority of rainfall is associated with summer thunderstorms between January and March, although southerly weather systems during autumn and winter are also responsible for a substantial amount of precipitation. Precipitation patterns are associated with high year-on-year variability, and river discharge regimes in the region are typically unpredictable, with high coefficients of variation in mean daily flow. This said, substantial hydrological variability is represented across coastal south-east Queensland. Four of the twelve hydrological classes identified on the Australian continent by Kennard et al. (2010) are present in the area: perennial, stable baseflow; perennial, unpredictable baseflow; intermittent, unpredictable; and highly intermittent, unpredictable summer dominated. Something about soils? Topography?

River flow regimes throughout the study region are modified by dams, weirs, intra- and inter-basin water transfer, and unsupplemented water extraction. The majority of the dams were constructed by the mid 1970s and have a maximum capacity of less than 50,000 ML. Two substantially larger dams (Wivenhoe Dam – 1,150,000 ML and Hinze Dam – 165,000 ML) in the area were constructed during the 1980s. Mackay *et al.* (2014) compared historic daily discharge data with modelled predevelopment discharge data and found that flow modification by structures and diversions in south-east Queensland is diverse and system specific. Reduced flow variability is prevalent, and while increased perenniality in drier systems and altered low spell duration are also common, few other generalisations can be made about the effects of regulation on streamflows in the region (Mackay et al., 2014).

*Site selection and vegetation sampling*

Riparian vegetation was surveyed between August and October in 2008, 2009 and 2010 at 44 sites. Twenty two river reaches were selected to sample the range of flow regime classes determined by a regional classification of flow regimes (see Mackay et al., 2014). Proximity to flow monitoring gauges with an associated recording history of >25 years was of primary importance. Duplicate surveys were made along each river reach as close as possible to the flow monitoring station, but separated by at least 2 km to ensure independence. Sampling sites required 100 continuous metres of relatively intact riparian vegetation, which was not subjected to regular burning and had not been cleared in at least 20 – 30 years. Ideally sites were not currently grazed, although this restriction was relaxed somewhat given the extensive pastoral land use throughout the region.

Three transects were randomly placed at each site, running perpendicular to the river. Additional transects were conducted at three sites (27, 31, 44), where low vegetation densities occurred. Transects extended from the water’s edge to the macrochannel bank, or a maximum of 50 m from the water’s edge. A standard sampling area was not used due to variability in vegetation structure, channel landforms and adjacent land uses. Site sampling areas were typically greater than 400 m2 (following Walker and Hopkins (1984), but ranged from 260 – 1013 m2. All trees, shrubs, ferns rushes, and sedges within a 5 m band centred on the transect line were identified and counted. Species identifications were confirmed by the Queensland Herbarium.

*Describing stream hydrology and quantifying flow regulation*

Daily discharge data for each reach were obtained from Queensland DERM (). Thirty five year time series spanning 1975 – 2009 were obtained where possible, although several reaches had truncated records.

Missing data were approximated by multiple linear regression (4 sites) and linear interpolation (1 site) using the Time Series Manager module in River Analysis Package (Marsh, Stewardson & Kennard 2003). We used the Time Series Analysis module in River Analysis Package to generate a set of 23 hydrological metrics for each site, based on a reduction of the minimally redundant set of ecologically relevant metrics for Australian rivers described by Kennard *et al*. (2010). These metrics were chosen as descriptors of the frequency and magnitude of flooding disturbance, as well as variability in water availability across seasons and between years (see Table 2for descriptions and rationale for inclusion of individual metrics). Collinearity between these metrics was analysed using principal components analysis (PCA); the results of this PCA as well as summary statistics for hydrological metrics are given in the *Supporting Information* *(S1)*. Parameters used to generate hydrological metrics were identical to Lawson *et al.* (2015). Metrics of flow magnitude which had units ML / day were standardised by mean daily flow to allow for comparison between different river channel sizes. These metrics therefore represent ratios of flow magnitude to mean daily flow.