Table 0.1: Justification for inclusion of traits in the functional diversity analysis.

Trait	*Definition*	*Ecological strategies and trade-offs captured by trait*
Specific leaf area	Ratio of one-sided leaf area to oven dry mass (cm2 g-1).	Indicates species position along the leaf economics spectrum (Wright et al. 2004). Associated with trade-off between rapid leaf construction and ability to tolerate stress (Reich & Wright 2003).
Maximum canopy height	Height above ground of apical meristem (m).	Integrates trade-off between competition for light and cost of construction and maintenance of support structures (Falster 2006).
Seed mass	Combined mass of the seed coat, endosperm and embryo (g). Does not include dispersal structures.	Indicates maternal investment in individual offspring (Leishman et al. 2000). Influences hydrochory (via seed buoyancy) (Carthey et al. unpublished data), and ability to establish in different soil moisture conditions (Leishman et al. 2000).
Wood density	Oven dry mass divided by green volume (g cm-3)	Confers mechanical strength to stems but costly to construct. Associated with slower relative growth rates (Chave et al. 2009) but greater ability to tolerate water stress and disturbance (Telewski 1995; Preston, Cornwell & Denoyer 2006; Lawson et al. 2015).
Flowering period length	Proportion of the year spent in flower (proportion, dimensionless)	Indicates species ability to respond reproductively to favourable conditions.
Leaf narrowness	Ratio of average leaf width to average length (ratio, dimensionless)	Narrow leaves present less photosynthetically active tissue but can regulate temperature more efficiently and thus maintain photosynthesis in hot, dry or highly insolated (i.e. disturbed) conditions (Cornelissen et al. 2003). Strongly indicative of rheophyty, the trait syndrome shared by plants adapted to growing near swift flowing, frequently flooded streams (van Steenis 1981).

Table 0.2: Hydrological parameters used as metrics of variability in high flow magnitude and frequency and predictability and consistency of water availability in the riparian environment. * - normalised by mean daily flow (ML/day)

Parameter	*Abbreviation*	*Units*	*Description*
Flood frequency and magnitude			Together, these metrics characterise patterns of flooding intensity and frequency. High spells are periods of flow above the 95th percentile on the flow duration curve. HSPeak describes the mean magnitude of peak flows during high spells throughout the record. MDFAnnHSNum describes the mean annual frequency of high spell periods. The coefficients of variation of these metrics between years characterise hydrological variability as it pertains to patterns of high flows. 20 year average return interval (ARI) floods are larger flow events with the potential to be geomorphically effective and rework the fluvial landscape.
Mean magnitude of high spells *	HSPeak	dimensionless	
CV of all years mean high spell magnitude	CVAnnHSPeak	dimensionless	
20 year ARI flood magnitude *	AS20YrARI	dimensionless	
Mean of all years number of high spells	MDFAnnHSNum	year-1	
CV of all years number of high spells	CVAnnHSNum	dimensionless	
Rise and fall rates			Flow rise and fall rates describe the shape of high flow curves. Interannual variability within these metrics captures the diversity of peak flow shapes within a system. Unfortunately, these metrics are constrained to daily resolution by the limitations of historical discharge records.
Mean rate of rise *	MRateRise	day-1	
Mean rate of fall *	MRateFall	day-1	
CV of all years mean rate of rise	CVAnnMRateRise	dimensionless	
CV of all years mean rate of fall	CVAnnMRateFall	dimensionless	

Parameter	*Abbreviation*	*Units*	*Description*
Colwell's indices			
Constancy of monthly mean daily flow	C_MDFM	dimensionless	Colwell's indices provide a measure of the seasonal predictability of flow events and therefore water availability within the riparian zone. Constancy (C) measures uniformity of flow across seasons, and is maximised when flow conditions do not differ between seasons. Contingency (M) is a measure of interannual uniformity in seasonal flow patterns, and is maximized when seasonal patterns of flow are consistent between years. We generated Colwell's indices for both average flow conditions and minimum flows conditions.
Contingency of monthly mean daily flow	M_MDFM	dimensionless	
Constancy based on monthly minimum daily flow	C_MinM	dimensionless	
Contingency based on monthly minimum daily flow	M_MinM	dimensionless	
Flow seasonality			
Average mean daily flow for Spring *	MDFMDFSpring	dimensionless	These metrics describe the average magnitude and variability within mean daily flows for each season. Averages and coefficients of variation are calculated across yearly means. Seasonal average mean daily flows were standardised by overall mean daily flow, so actually represent the ratio of mean daily flow in a given season to the total mean daily flow.
Average mean daily flow for Summer *	MDFMDFSummer	dimensionless	
Average mean daily flow for Autumn *	MDFMDFAutumn	dimensionless	
Average mean daily flow for Winter *	MDFMDFWinter	dimensionless	
CV of mean daily flow for Spring	CVMDFSpring	dimensionless	
CV of mean daily flow for Summer	CVMDFSummer	dimensionless	
CV of mean daily flow for Autumn	CVMDFAutumn	dimensionless	
CV of mean daily flow for Winter	CVMDFWinter	dimensionless	

Table 0.3: Multiple regression models with associated fitting parameters. * in the model formula denotes both summation as well as interaction between variables. R2 values have been adjusted for multiple regression for models using more than one variable. The optimal model according to AICc is indicated by bold typeface.

#	*Model*	*adj. R2*	*AICc*	*delta AIC*
1	FDis ~ CVAnnHSNum	0.296	-46.14	12.78
2	FDis ~ CVAnnHSPeak	0.577	-53.79	5.13
3	FDis ~ MDFMDFSummer	0.503	-51.37	7.56
4	FDis ~ CVAnnHSNum + CVAnnHSPeak	0.636	-54.52	4.40
5	FDis ~ CVAnnHSNum + MDFMDFSummer	0.681	-56.50	2.42
6	FDis ~ CVAnnHSPeak + MDFMDFSummer	0.561	-51.71	7.21
7	FDis ~ CVAnnHSNum * CVAnnHSPeak	0.655	-51.95	6.97
8	FDis ~ CVAnnHSNum* MDFMDFSummer	0.665	-52.40	6.53
9	FDis ~ CVAnnHSPeak * MDFMDFSummer	0.566	-48.54	10.39
10	FDis ~ CVAnnHSNum + CVAnnHSPeak + MDFMDFSummer	0.704	-54.25	4.68
11	FDis ~ CVAnnHSNum * CVAnnHSPeak + MDFMDFSummer	0.709	-50.14	8.79
12	**FDis ~ CVAnnHSNum + CVAnnHSPeak * MDFMDFSummer**	0.838	-58.92	0
13	FDis ~ CVAnnHSNum * CVAnnHSPeak * MDFMDFSummer	0.944	-48.62	10.30

Table 0.4: Regression summary for Model 12. Beta values are regression coefficents (B) standardised by the standard deviation of the term.

	B	*SE*	*beta*	*t*	*p*
CVAnnHSNum	0.240	0.054	0.540	4.414	0.001
CVAnnHSPeak	0.071	0.026	0.498	2.773	0.020
MDFMDFSummer	0.074	0.024	0.506	3.056	0.012
CVAnnHSPeak * MDFMDFSummer	-0.190	0.060	-0.459	-3.186	0.001

Table 0.5: Partioning of variance in FDis as explained by optimal hydrological and climatic models. The — symbol denotes controlled for; that is, variation explained non-redundantly by a fraction.

Combined fractions:	*df*	*adjusted R2*
a + b (hydrology)	4	0.838
b + c (climate)	2	0.629
a + b + c (hydrology + climate)	6	0.854
Individual fractions:		
a (hydrology — climate)	4	0.226
b (shared variation)	0	0.612
c (climate — hydrology)	2	0.016
d (unexplained variation)		0.46