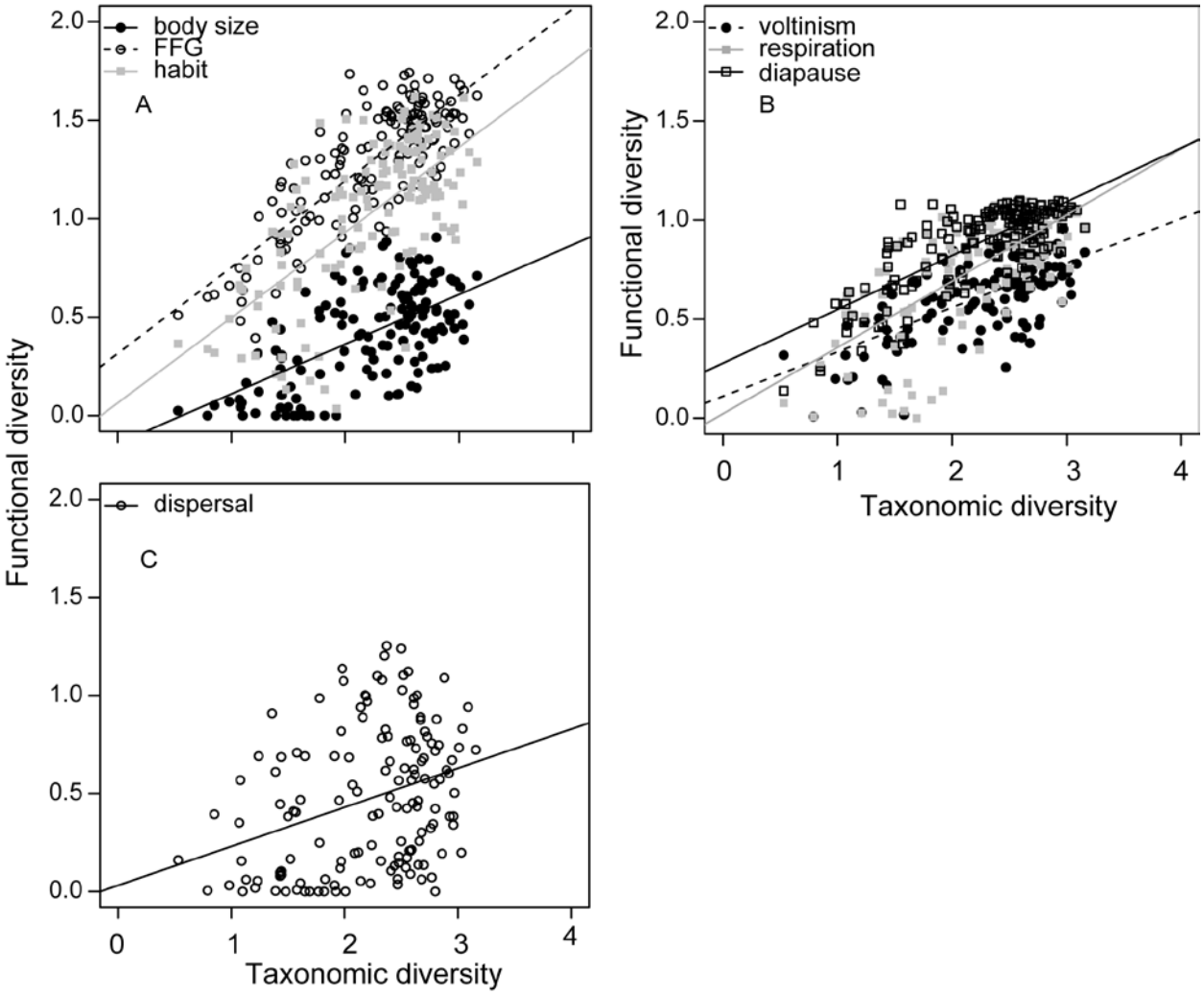

Appendix S4. Relationship between responses of functional and taxonomic diversity for individual functional traits. A.—Functional feeding groups (n = 7 states), body size (n = 3), and habit/locomotion (n = 7). B.—Voltinism (n = 3, slope = 0.22, R^2 = 0.43, $p < 0.0001$), respiration (n = 3, slope = 0.33, R^2 = 0.47, $p < 0.0001$), and diapause (n = 3, slope = 0.27, R^2 = 0.61, $p < 0.0001$). C.—The relationship with dispersal was significant, but weak (n = 4, slope = 0.20, R^2 = 0.10, $p < 0.0001$).

Summary of quantile statistics

In summary, across all statistically significant relationships between 5 diversity measures and 4 flow metrics, 18% were floors (0.05 quantile), 28% were the 0.25 quantile, 22% were the median quantile (0.5), 20% were the 0.75 quantile, and 12% were the upper quantile (ceiling, 0.95). The median was not significant in 30% of relationships (6 of 20). In only 3 instances was the greatest rate of change observed at the median quantile. The response of taxonomic diversity and functional and taxonomic richness varied across regression quantiles (slopes), but overall maximum richness and diversity occurred at perennial (100% flow permanence) sites and decreased with decreases in flow permanence. In some cases, (e.g., taxonomic richness) the mean and variance also decreased with decreasing flow permanence. However, low taxonomic richness was found across the permanence gradient suggesting at these sites colimiting factors additional to flow are constraining richness and that diversity–flow patterns are governed by processes operating on different domains of the data. Occurrences in which the upper quantiles (in our case, 0.75 and 0.95) slopes are greater than the median quantile slope provides evidence that limiting relationships between the response and predictor are different than the relationship of central tendency or mean response. When comparisons could be made, we found 2 instances (6.25%) of steeper slopes in 1 of the upper quantiles (0.75) compared to the median quantile, suggesting taxonomic richness is to some extent limited by flow permanence (% flow in year and by season) and that using linear models would have underestimated their effect on taxonomic richness and diversity. Conversely, 12 slopes for lower quantiles (<0.50) had greater rates of change then the median quantile model suggesting these relationships would overestimate the effect of flow predictors if tested with linear regression. However, by using quantile regression

we show there is a lower threshold of response. One-hundred percent of the possible relationships with flow permanence were strong (≥3 quantiles significant for each relationship), highlighting the overwhelming importance of flow on macroinvertebrate diversity in arid-land streams.