**Results:**

*Diversity:* Univariate linear regressions indicate Fish Shannon index values correlate positively with annual precipitation and negatively with conductivity, canopy coverage, and ammonia concentrations (Figure 2). This contrasts with macroinvertebrate Shannon index values, which correlate negatively with low flow pulse percent (Figure 3) but lack significant correlations with other environmental predictors including annual precipitation (Figure 6). Significant values were determined to have a *p*-value less than 0.05.

Multivariate generalized linear models (GLMs) indicate annual precipitation as a positive driver of fish diversity in the top four dredge models. Individual models indicate low flow pulse percent, canopy coverage, and ammonia negatively correlate with fish diversity. Macroinvertebrate diversity negatively correlates with low flow pulse percent and high flow pulse percent in three of the top four AICc ranked GLMs. Dissolved oxygen negatively correlates with macroinvertebrate diversity in two of the top four AICc ranked GLMs (Table 4).

*Composition*: The NMDS ordination of fish assemblages indicate compositional shifts across the precipitation gradient (Figure 4). Hierarchical clustering resulted in 3 site groupings labeled “semi-arid” (yellow), “mesic” (green), and “sub-humid” (blue). Semi-arid communities are dominated by *Poecilia formosa*, *Gambusia affinis*, and *Pimephales vigilax*. Communities in mesic and sub-humid climates contain a variety of Lepomis species, but mesic streams uniquely contain *Herichthys cyanoguttatus*. Sub-humid streams uniquely contain *Trinectes maculatus*, *Ameiurus melas*, and *Cyprinella venusta*. Fitted environmental predictors indicate that variation along the NMDS-1 axis correlates with high flow pulse percent with lesser contributions by ammonia, nitrate, and dissolved oxygen concentrations, Variation along the NMDS-2 axis correlates with flash index and annual precipitation with lesser contributions by conductivity, ammonia, nitrate, and dissolved oxygen concentrations.

The NMDS ordination of macroinvertebrate assemblages also display compositional shifts along the precipitation gradient (Figure 5). Macroinvertebrate assemblages in semi-arid climate contain a variety of gastropod taxa including *Amnicola sp. Bythinia sp. And melanoides sp.* Mesic communities contain species from a greater number of taxonomic orders including Ephemeroptera, Trichoptera, Coleoptera, and Hemiptera. Sub-humid communities contain a greater proportion of Crustaceans including Palaemonetes sp., Orconectes sp., and isopods in the genus Caecidotea. Fitted environmental variables indicate that variation along the NMDS-1 axis correlate with High flow pulse percent and to a lesser extent, nitrate, ammonia, and dissolved oxygen concentrations. Variation on the NMDS-2 axis correlate with annual precipitation, flash index and conductivity. The separation of site-groupings within the ordination space coincides with projected axes of the fitted ammonia and dissolved oxygen variables.