

Epstein, J, W. Pine, C. Romagosa, M. Scott, C. Phillips, C. Marion, and B. Baiser. 2018. State and regional-scale patterns and drivers of freshwater fish functional diversity in the southeastern US. *Transactions of the American Fisheries Society* Online Early View DOI:10.1002/tafs.10110 (contact [Mark Scott](#) to request reprint).

## Abstract

Understanding biodiversity patterns and their drivers across large spatial scales has become a necessary component of addressing complex multiscale conservation challenges. Increasingly, functional diversity measures are being used to provide insight on the ecological integrity of ecosystems. We estimated functional diversity at two different spatial extents using data sets of contrasting sampling intensity and time duration and compared these two different approaches. For our regional-scale analysis, we used large-scale fish sampling data sets and identified 397 species across subbasins within the southeastern USA. For our state-scale analysis, we used data from the South Carolina Department of Natural Resources Statewide Stream Assessment through which 101 species were collected from wadeable streams across South Carolina. For all fish species, we scored trophic and reproductive traits and measured trophic and reproductive functional diversity across subbasins and South Carolina streams. We assessed differences in functional diversity between level III ecoregions, quantified the influence of imperiled and invasive species on functional diversity, and modeled relationships between functional diversity and environmental variables at the state scale using Random Forest regression. At both scales, we found support for higher trophic functional diversity in high-elevation ecoregions, while reproductive functional diversity was generally higher in low-elevation ecoregions. The inclusion of imperiled species increased functional diversity estimates, while invasive species decreased functional diversity estimates except for reproductive functional diversity at the regional scale. Environmental variables that correlated with functional diversity at the state scale included forest cover, elevation, and conductivity. The observed spatial patterns of functional diversity, the environmental variables identified as predictors of functional diversity, and knowledge of how imperiled and invasive species influence functional diversity can be used to guide freshwater fish conservation efforts across the southeastern U.S. region. Additionally, these findings highlight the utility of data from intensive, standardized, broad-scale aquatic surveys in addressing these and similar questions regarding freshwater diversity.

Marion, C.A., M.C. Scott, and K.M. Kubach. 2015. Multi-scale environmental influences on fish assemblage structure of South Atlantic coastal plain streams. *Transactions of the American Fisheries Society* 144:1040-1057. DOI:10.1080/00028487.2015.1059887 (contact [Mark Scott](#) to request reprint).

## Abstract

South Atlantic coastal plain streams are unique and understudied freshwater environments that provide crucial habitats for a wide range of aquatic taxa. We investigated patterns in fish

assemblages across South Carolina's coastal plain, and developed statistical models to identify the dominant multiscale abiotic environmental factors that influence assemblage structure. Cluster and indicator species analyses of fish assemblage data collected at 208 wadeable streams indicated the presence of four predominant species associations that commonly occur in the South Atlantic coastal plain, which we termed the (1) fluvial, (2) Eastern Mudminnow, (3) centrarchid, and (4) nonfluvial assemblages. A random forest analysis indicated that geographic gradients and instream habitat variables associated with velocity, channel form, stream size, depth, and large wood generally played a greater role in distinguishing fish assemblages than catchment land cover. A follow-up principal component analysis showed that these instream habitat variables showed weak relationships with current anthropogenic land-cover conditions. We suggest several possible explanations for our findings, including (1) a sustained dynamic equilibrium among catchment, riparian, and instream conditions over time may encourage assemblage partitioning among differential instream habitats, (2) past landscape conditions may have a greater influence on current instream habitat conditions and fish assemblage structure than current landscape conditions, (3) weak relationships between catchment land cover and instream habitats may be common in low-elevation regions, and (4) seasonal variation in hydrologic patterns may dominantly influence instream habitat conditions and fish assemblage structure. Our study adds essential information towards a better understanding of how South Atlantic coastal plain fish assemblages respond to environmental factors across multiple spatial scales. Such knowledge will help improve management and conservation strategies, as well as assist in the development of appropriate indicators for standardized evaluations of ecological integrity.