Research Interests

The overarching goal of my research program is to apply ecological and statistical theory to understand processes affecting aquatic and riparian ecosystems in an era of global change. I am especially interested in identifying the consequences of anthropogenic stressors with which organisms in these systems now have to cope, including nonnative species, climate change, pollution, and land use land cover change. Collaboration with governmental and academic agencies has and will continue to be an important part of this research program, because it helps ensure science is translated to policy. When conducting research I combine observational and experimental approaches followed by rigorous statistical analyses to separate pattern from process. My areas of research expertise have application in all ecological fields. These areas of expertise include sampling theory (population estimation; occupancy and detection modeling), bioenergetics (primary and secondary productivity; food webs), and numerous statistical techniques (multivariate analysis; information theoretic approaches; generalized linear models). These approaches have been applied in addressing my central research questions.

Assessing the influence of wildfire disturbance on the imperilment of fauna in riparian and aquatic ecosystems has been a major research avenue encompassed within my research program. Measuring the effects of wildfires, ash flows, and flood disturbances on habitat, algae, macroinvertebrates, fishes, and tadpoles in the upper Gila River, NM was a project I completed to help address this question. This research used sampling theory (occupancy and detection modeling) to examine metapopulation responses to wildfire, and statistical analyses that accounted for the non-normal (generalized linear models) and temporally-correlated (repeated measures analysis of variance) structure of the data to statistically address the questions (Whitney et al. in press, a&b). Determining what environmental factors are associated with the success or imperilment of fauna has been another major research question I have pursued as part of my research program. As part of addressing this question I measured the success of native and nonnative crayfish, fishes, and tadpoles in the upper Gila River, NM, as quantified by their secondary production. Taxa success was then related to a suite of abiotic (nutrient concentrations; water depth, velocity, and temperature) and biotic (primary production, algal biomass, macroinvertebrate secondary production) environmental variables. This research required sampling theory to generate robust population estimates and bioenergetics models to estimate production. Multivariate statistical analyses (principal component analysis) were used

to simplify analysis of complex variables, and an information theoretic approach (Akaike Information Criterion) was implemented to distinguish among competing models explaining taxa success (Whitney et al. 2014). These examples demonstrate how my areas of research expertise (sampling theory, bioenergetics, and ecological statistics) can be used to answer specific questions that are of general ecological merit.

References

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