NC Native Plant Society - Shinn Fund Research Report

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Objectives & Context

Coastal freshwater wetlands of North Carolina are increasingly experiencing saltwater intrusion and sea level rise (SWISLR). Exposure to higher salinity is associated with plant community shifts, namely shifts from forested to shrub-dominated wetlands. These wetlands are important carbon sinks as well as habitat for many species of rare and endemic plant species. Here I sought to address how plant communities and relevant soil characteristics are changing in response to saltwater intrusion and sea level rise in freshwater coastal wetlands.

Data Collection

I sampled three transects in Alligator River National Wildlife Refuge between May 16-19, 2022 to assess plant community change with saltwater intrusion (transect locations: Mashoes Rd., Point Peter Rd., and Pamlico Rd.). These transects were established to capture a saltwater exposure gradient and act as a space-for-time substitution simulating saltwater intrusion. Transects included salt marsh, shrubland, ghost forest, and intact forest cover types. Data collected from between 8 and 11 points along each transect included percent cover of 1x1m plots, overstory and understory density and composition, and two soil cores. I conducted a nonmetric multidimensional scaling analysis of percent cover data. From soil cores, I analyzed percent soil moisture, water extractable salt concentration, pH, total carbon, and total nitrogen, and I am in the process of sequencing microbial DNA.

Findings

Soil chemistry: I found that soil chemistry varied predictably across transects, with soil salinity and pH decreasing, C:N ratio increasing from marsh to intact forest. pH and C:N ratio were strongly correlated with salinity ($P=<0.001$ and 0.001, respectively).

Plant community: I identified 48 understory plant species and 7 overstory plant species. Transect, soil salinity, pH, and C:N ratio were all significantly correlated with plant community composition ($P=0.005$, 0.006, 0.001, and 0.007, respectively). Six understory species significantly contributed to patterns of variation across plots (Figure 1). Areas of low salinity in the Pamlico Rd. transect were dominated by *Pteridium aquilinum* and *Arundinaria gigantea,* while low salinity plots of the Mashoes Rd. and Point Peter Rd. transects were characterized by *Woodwardia virginica* and *Andropogon tenuispatheus*. Areas of higher salinity were dominated by *Distichlis spicata* and species of *Schoenoplectus* in the PAM transect, and *Spartina patens* in the Point Peter Rd. transect. As expected, average stem distance from 1x1m plot center of both

over and understory decreased from marsh to forest, meaning density of both trees and shrubs increased with distance from marsh, but only overstory had a significant relationship with distance from marsh (P=0.029). Rare and carnivorous plant species were observed along Mashoes Rd. transect including: *Pogonia ophioglossoides* (Snakemouth orchid), *Utricularia subulata* (Zigzag bladderwort), *Utricularia gibba* (humped bladderwort), *Sarracenia flava* (yellow pitcher plant), *Drosera intermedia* (spoonleaf sundew).

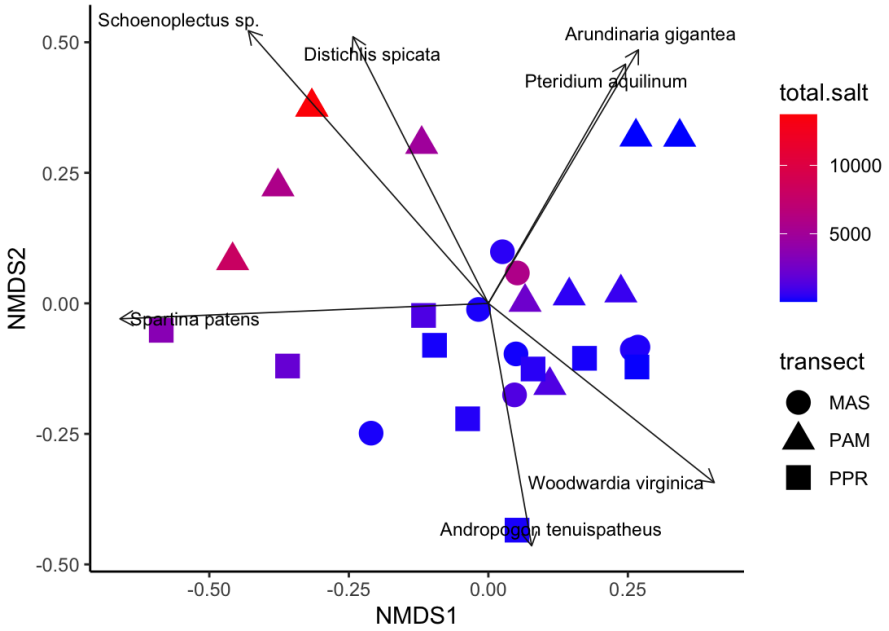

Figure 1. Nonmetric multidimensional scaling analysis of percent cover data among plots. Each point represents a single 1x1m plot. Point color denotes total ion concentration, while shape represents transect identity. Arrows and corresponding annotation represent species that contributed most to variation observed across plots. MAS=Mashoes Rd., PAM=Pamlico Rd., PPR=Point Peter Rd.