Factors Affecting Pteridophyte Distribution at Spring Sites in the Tombigbee National Forest

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Introduction

In plant ecology, there has been relatively little research done on the community structure of pteridophytes, especially compared to seed plants and bryophytes (Greer et al, 1997). This study aims to provide insight into the environmental variables that affect pteridophyte distribution. Specifically, this survey seeks to investigate pteridophyte communities in 27 randomly-selected spring-fed riparian areas across the Tombigbee National Forest in Winston and Choctaw counties, Mississippi.

Methods & Data

A 50 meter transect was run from the headwaters of each spring, along the stream body. Every 10 meters (including the zero meter mark), a perpendicularly bisecting tape measure was extended three meters from either side of the transect. At the end of each three meter bisector, a 1m² plot was sampled. Additionally, another plot was centered on main transect, to make for three plots sampled per bisector (18 plots/transect).

Factors tested included:

- percent vegetation cover at each plot
- soil temperature at each plot
- canopy cover every 10 meters
- two soil samples per transect to determine soil pH, soil texture, and nutrient levels.

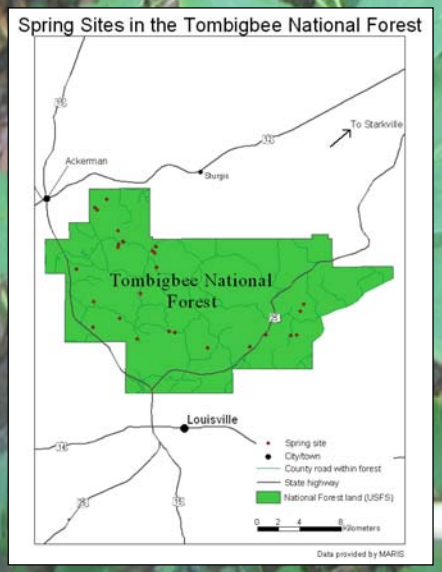


Fig. 1 Spring locations

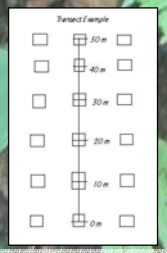


Fig. 2 Transect example

Fig. 3 Plot example

Results

Soil texture was the primary factor influencing pteridophyte distribution, followed closely by soil nutrient levels. However, soil nutrients were highly dependent on soil texture, with all of the major nutrients being positively correlated with clay content and negatively correlated with sand content. Phosphorous and sulfur also exhibited a very strong positive correlation with % soil organic matter. These were fairly strong relationships, with most of the r² values falling between 0.3 and 0.65. All other environmental variables (soil temperature, canopy cover, distance to nearest road, % soil organic matter, and soil pH) turned out to be much less important.

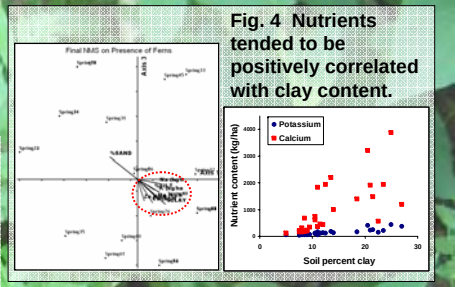
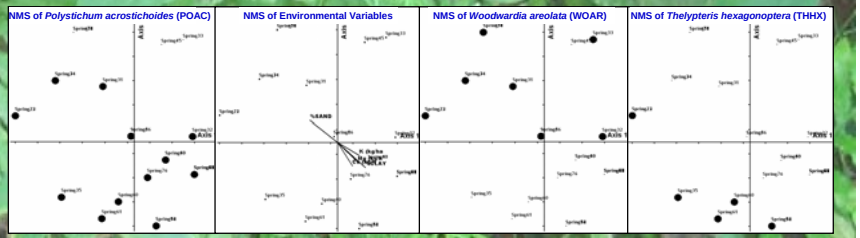


Fig. 4 Nutrients tended to be positively correlated with clay content.

Fig. 5 Fern species appeared to be influenced by soil composition. For example, WOAR prefers sandy sites with lower nutrient concentrations, while POAC prefers clayey sites with higher nutrient levels, although it occurs broadly.



Discussion

Soil texture appears to be the main determinant in the spatial distribution of pteridophytes at springs in the Tombigbee National Forest. Soil texture is also heavily correlated with soil nutrients, which could also be an explanatory factor. However, because the correlation between the fern species and environmental variables isn't especially strong (highest r² = ~0.4), this suggests two possible things. Either the totality of the environmental variables interact to help determine pteridophyte distribution, or there are interactions between other organisms (competition, predation, facilitation, etc.) that influence these patterns. More likely than not, it is probably the result of both. This indicates that more research needs to be done on the community scale, an area lacking within pteridophyte ecology.

Literature cited:
Greer, Gary K., Robert Lloyd, Brian McCarthy. Factors influencing the distribution of pteridophytes in a southeastern Ohio hardwood forest. *Journal of the Torrey Botanical Society* 124.1 (1997): 11 – 21.

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