Title: Understanding post-fire spatial and temporal heterogeneity in microbial community composition using a landscape approach

Erica A.H. Smithwick[1]
[1] Department of Zoology, University of Wisconsin, Madison WI

Disturbances may increase or decrease spatial variability in ecosystem processes. Ecosystem scientists have increasingly focused attention on disturbance-generated patterns and processes, but the mechanisms underpinning ecosystem heterogeneity remained largely unexplored. By focusing on the spatial and temporal heterogeneity of microbial responses to disturbance (a 'microbial landscape ecology'), it may be possible to elucidate ecosystem responses to disturbance by linking belowground heterogeneity to ecosystem function. Here I ask how microbial community composition (hybrid phospholipid fatty acid/fatty acid methyl ester) varies in time and space after stand-replacing fire in the Greater Yellowstone Ecosystem. In a 0.25 ha area, the average coefficient of variation (CV, n=81) of post-fire lipid abundance ranged from 2 to 127% among individual lipids, averaging 49%. The CV of lipid abundance among 14 stands varying in density and productivity recovering from the 1988 fires (stand age=15 years) ranged from 15 to 71%, averaging 33%. The CV ranged from 52 to 235% among 20 mature stands (50-350 years), averaging 107%. Among guilds, protozoa and branched lipids tended to be least variable across space, while hydroxy, cyclopropyl, actinomycetes, and arbuscular mycorrhizal fungi tended to be most variable. Thus, variability in ecosystem function after disturbance may be dependent on the response of specific lipids or guilds. Overall, results suggest that between-stand variation increased with increasing stand age although within-stand spatial variability immediately after fire was surprisingly high, indicating both fine- and coarse-scale responses to disturbance across the Yellowstone landscape.