Monica G. Turner, K.L. Metzger, W.H. Romme, E.A.H. Smithwick, D. B. Tinker and J. Zhu

Spatial and temporal variation in net nitrogen mineralization following stand-replacing fire in the Greater Yellowstone Ecosystem.

Spatio-temporal variation in nitrogen (N) cycling following stand-replacing fires is not well understood. We examined variability in post-fire net N mineralization rates following fires that burned in summer 2000 in coniferous forests of the Greater Yellowstone Ecosystem. Percent aboveground cover and nitrate and ammonium availability (using *in situ* resin cores) were sampled annually (2001 to 2003) in ten 0.25-ha plots. Among-stand variation was analyzed using means (n = 20 cores/plot) from all ten plots. Among stands, net nitrate availability averaged 14.9 mg N * kg $soil^{-1}$ * yr^{-1} in 2002 and increased to 27.7 mg N * kg $soil^{-1}$ * yr^{-1} in 2003. Variation in nitrate availability was explained by percent cover of charred litter, coarse woody debris, and graminoids (r^2 = 0.82). Ammonium availability ranged from –30.7 to 22.2 mg N * kg $soil^{-1}$ * yr^{-1} in 2002, did not differ between years, and its variation was not explained by measurements of aboveground cover. Within-stand spatial variation was studied in four of the plots using a cyclic sampling design (n = 81 cores/plot, 2-m minimum lag distance) derived from geostatistics. Within-stand variation in net N mineralization was high (CVs ranging from 75 to 125% for nitrate and 190 to 918% for ammonium), and semivariogram analyses revealed little spatial dependence. Only 15% of the within-stand variance was explained by measurements of aboveground cover. Thus, variability in N mineralization was related to aboveground cover among stands but not within stands, suggesting that controls on net N mineralization may vary with spatial scale. Fine-scale variation in net N mineralization following stand-replacing fire may reflect heterogeneity of substrates and microbial communities in the soil, although feedbacks between vegetation and net N mineralization may develop as succession proceeds.