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Impacts of Chronic N Amendments on Tree Reproduction in an Oak-dominated Stand at Harvard Forest

As fossil fuel consumption is elevating atmospheric CO_2, atmospheric Nitrogen (N) compounds are also increasing and cycling rapidly back into terrestrial systems, with potentially more drastic impacts on ecosystem function. Since 1989, the Chronic Nitrogen Amendment Study at Harvard Forest (Petersham, Massachusetts, USA) has compared control N-limited hardwood forest plots to experimental plots receiving 50 ("low") or 150 ("high") g m^{-2} yr^{-1} of NH_4NO_3 solution, representing 6- and 18-fold increases over ambient inputs. Beyond the primary goal of analyzing how ecosystem functions may change in response to rising N deposition, this experiment offers a superb opportunity for linking such changes with organismal and population ecology mechanisms. We have investigated how control vs. artificially elevated N inputs influence (1) the reproductive portion of annual litterfall, (2) acorn abundance, and (3) viability and quality of acorns and oak seedlings. Analysis of the non-foliage portion of litterfall samples collected from 1997-2002 revealed interannual variation in the biomass of these tissues, including a large increase in 2001 not observed in corresponding leaf tissue samples. Reproductive litterfall biomass also increased significantly with N inputs, as did acorn abundance in 2003 and 2004. In 2003 and 2004, acorn size was significantly lower in control plots, known to be N-limited, but non-significant differences among treated plots did not correspond to N input levels, possibly reflecting genetic differences among trees on these plots. We have also quantified the impact of common insects (e.g., *Curculio* sp.), documenting uniformly severe damage across control and treated plants in 2003 and 2004.