

## ABSTRACT

### **Project title: COLLABORATIVE RESEARCH: Disturbance, succession and forest carbon dynamics: a large-scale manipulation at the University of Michigan Biological Station**

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1. *Broad project objectives:* a) Quantify C exchange processes during and after a successional shift from mature aspen to a young mixed conifer/deciduous forest; b) Investigate the interactive role of disturbance and succession in governing landscape-level variability in C storage; c) Continue measurements of mass and energy exchange over a maturing aspen-dominated hardwood forest, building on more than eight years of continuous forest C cycle studies.
2. *Location of research activities:* The University of Michigan Biological Station Ameriflux site, Pellston, Michigan.
3. *List of hypotheses to be tested:* a) There will be a brief, 3 to 5-yr, reduction in NEP post-treatment due to reduced LAI and increased heterotrophic respiration. This will be followed by the rapid recovery of LAI and eventual stabilization of NEP above control levels. b) Overstory aspen and birch mortality will result in a pulse of increased fine root turnover that will temporarily increase heterotrophic respiration by up to 25 %, and concurrently reduce NPP by up to 42 %. c) Overstory aspen and birch mortality will increase soil and forest floor C storage by substantially increasing detritus inputs to the soil. d) Successional change in canopy composition will result in more variable forest microclimates and a more patchy distribution of nutrients, both of which will be important regulators of landscape-level variability in C storage. e) The reallocation of N during succession will affect rates of regrowth in the developing canopy.
4. *Methods outline:* We will accelerate forest ecological succession by killing all mature aspen and birch (~37 and 5 % canopy LAI, respectively) within a 33 ha treatment stand close to but outside the flux footprint of the existing meteorological tower and control site. A second tower (already funded) will begin operating within the treatment stand in 2006, 2 years prior to girdling. Three additional, 2 ha stands also will be treated to serve as replicate plots for ecological measurements. Ecological and meteorological measurements will be conducted in the footprint of the treatment and control stands before and after the girdling treatment to quantify effects of climate and succession on C pools and fluxes.
5. *Expected accomplishments/deliverables:* Our objectives support focus 3 of the NICCR RFP-01, strengthening our empirical understanding of spatial and temporal variability in CO<sub>2</sub> sources and sinks for a regionally important ecosystem. We expect this research will allow us to continue the current pace of 3 to 4 peer-reviewed publications per year (29 total/8 years) and more than a dozen presentations annually.