Simulations of Forest Response To Climatic Change Must Learn from Experimental Results

Accurate predictions for the response of the eastern deciduous hardwood forest to multiple environmental changes associated with climatic change are a key output for the US Climate Change Science Program. Researchers at Oak Ridge National Laboratory incorporated their experimental findings from a range of field experiments including elevated CO_2, warming, precipitation change, or increased tropospheric ozone (O_3) into stand level models to predict future responses of eastern forests in the year 2100. Single-factor model predictions demonstrated maximum sensitivity of eastern forests to CO_2 and temperature change with minor effects from precipitation change or ozone exposure. Multi-factor simulations that ignored experimentally-observed vegetation adjustments predicted small long-term reduction in forest carbon gain by 2100, but the opposite pattern (a 20% increase) was obtained when 'lessons-learned' from experimental studies were included in the analyses. These analyses identified critical areas of uncertainty for multivariate predictions of future ecosystem response, and underscored the importance of long-term, field experiments for the characterization of tissue and plant acclimation and growth responses under complex environmental scenarios.

Reference: Hanson PJ, Wullschleger SD, Norby RJ, Tschaplinski TJ, Gunderson CA (2005) Importance of changing CO_2, temperature, precipitation, and ozone on carbon and water cycles of an upland-oak forest: incorporating experimental results into model simulations. *Global Change Biology* (in press).

Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831
http://www.esd.ornl.gov/