Too little nitrogen may restrain plants' carbon storage capability, research shows

October 2 2012

Plants' ability to absorb increased levels of carbon dioxide in the air may have been overestimated, a new University of Minnesota study shows.

The study, published this week in the journal *Nature* Climate Change, shows that even though plants absorb large amounts of carbon dioxide and actually can benefit from higher levels of it, they may not get enough of the nutrients they need from typical soils to absorb as much CO_2 as scientists had previously estimated. Carbon dioxide absorption is an important factor in mitigating fossil-fuel emissions.

The study, one of only three such long-term experiments in the world, is based on 13 years of research at the Cedar Creek Ecosystem Science Reserve north of the Twin Cities. U of M scientists Peter Reich and Sarah Hobbie monitored nearly 300 open-air plots planted with perennial grasses with varying levels of atmospheric carbon dioxide and soil nitrogen.

"Rather than building a time machine and comparing how ecosystems behave in 2070 – which is hard to do – we basically create the atmosphere of 2070 above our plots," Reich says.

The results suggest that limited levels of fertility typical in most soils likely eliminate a large fraction of the capacity of plants to scrub CO_2 out of the atmosphere, Reich says. "It would be better if there were experiments like ours in tropical rain forest, temperate forest, and tundra, to see how well responses there match with what we have found.

But as such experiments do not exist, our results play an important role in addressing this issue for ecosystems everywhere."

Reich is a Regents professor in the forest resources department of the university's College of Food, Agricultural and Natural Resource Sciences and Hobbie is a professor in the ecology, evolution and behavior department in the College of Biological Sciences. Both are fellows of the university's Institute on the Environment.

Provided by University of Minnesota